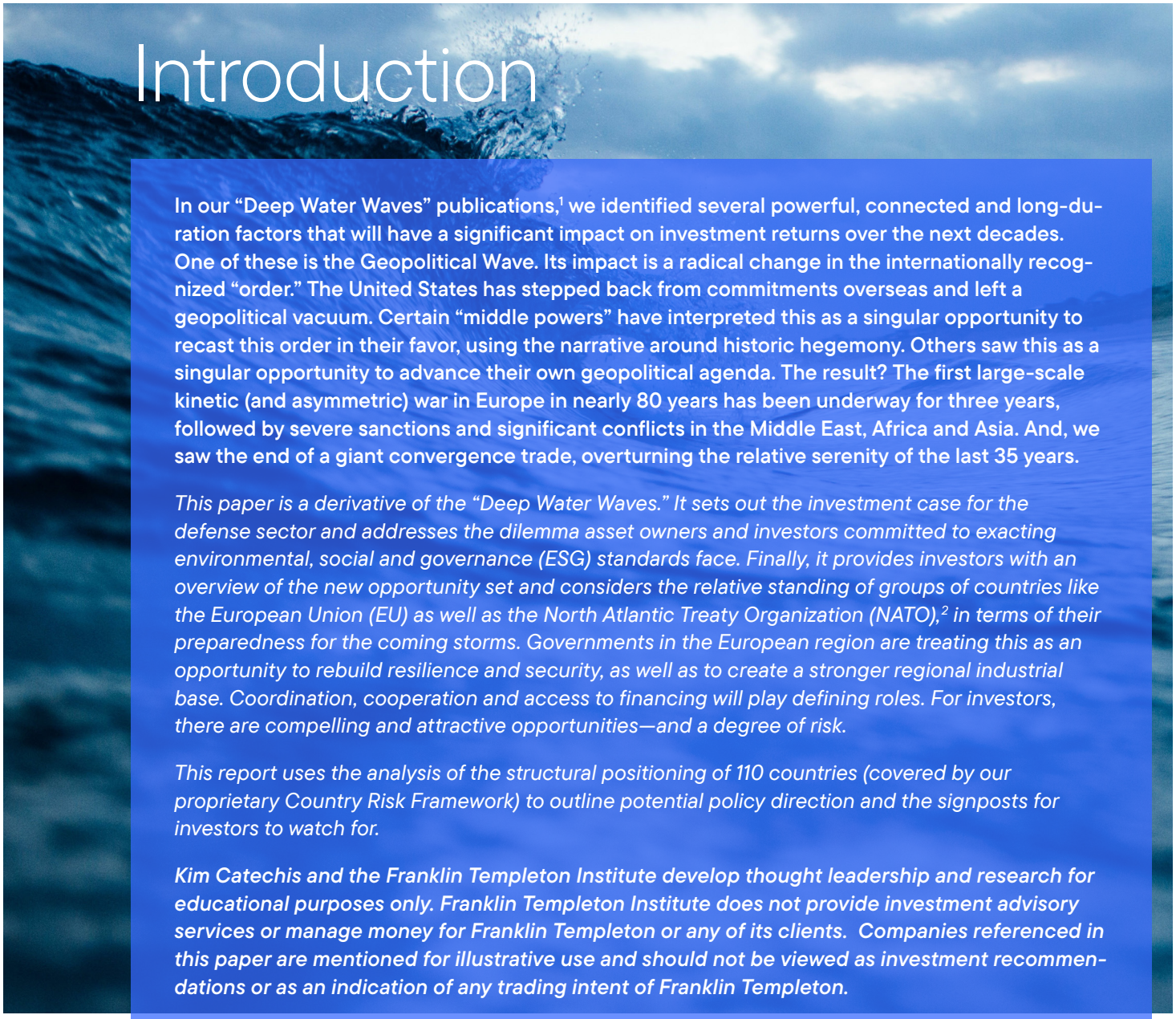
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Deep waves
The paradoxical trinity of defense



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Introduction

In our "Deep Water Waves" publications,[1] we identified several powerful, connected and long-duration factors that will have a significant impact on investment returns over the next decades. One of these is the Geopolitical Wave. Its impact is a radical change in the internationally recognized "order." The United States has stepped back from commitments overseas and left a geopolitical vacuum. Certain "middle powers" have interpreted this as a singular opportunity to recast this order in their favor, using the narrative around historic hegemony. Others saw this as a singular opportunity to advance their own geopolitical agenda. The result? The first large-scale kinetic (and asymmetric) war in Europe in nearly 80 years has been underway for three years, followed by severe sanctions and significant conflicts in the Middle East, Africa and Asia. And, we saw the end of a giant convergence trade, overturning the relative serenity of the last 35 years.

This paper is a derivative of the "Deep Water Waves." It sets out the investment case for the defense sector and addresses the dilemma asset owners and investors committed to exacting environmental, social and governance (ESG) standards face. Finally, it provides investors with an overview of the new opportunity set and considers the relative standing of groups of countries like the European Union (EU) as well as the North Atlantic Treaty Organization (NATO),[2] in terms of their preparedness for the coming storms. Governments in the European region are treating this as an opportunity to rebuild resilience and security, as well as to create a stronger regional industrial base. Coordination, cooperation and access to financing will play defining roles. For investors, there are compelling and attractive opportunities—and a degree of risk.

This report uses the analysis of the structural positioning of 110 countries (covered by our proprietary Country Risk Framework) to outline potential policy direction and the signposts for investors to watch for.

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Executive summary



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The situation report

Geopolitical pressures might appear to be very slow-moving, with little immediate impact on capital markets. That view seemed justified up until around a decade ago. Like climate change, great power rivalries resulting in escalating geopolitical pressures have now become immediate, direct and global in reach, but uneven in their intensity. Geopolitical considerations influence policy and hence investment returns, both directly and indirectly via their impact on the affected countries.

The abrupt reversal of the "peace dividend" has led us to the spectacle of old-fashioned kinetic warfare at grand scale as well as close urban warfare unseen in Europe since the end of World War II. Further, the deployment of drones and hypersonic missiles and electronic signal jamming has changed the nature of war. The shock has fueled a rapid acceleration of investment in defense, from the upgrading of hardware through the modernization of equipment, the updating of training to absorb the lessons of Ukraine and Gaza, the recalibration of financing and supply chains, and the investment to rapidly increase domestic production capacity.

The investment opportunity

These developments reopen a fast-growing investment opportunity in the defense sector. The commitment by European NATO members to invest over US$400 billion annually[3] for at least the next decade is just the start, as the recent growth in the number of private equity and public markets mandates suggests. Defense spending in 2023 reached its ninth successive annual record, totaling US$2.4 trillion.[4] This amount represents a 36% increase over the past decade. Over the next six years, NATO spending alone is estimated at US$8.9 trillion, of which US$3.2 trillion is from European NATO members and Canada.[5] It works out to be around US$500 billion per year, rising to US$600 billion in 2029.

A key factor in the next decade is the political will to push ahead. A second is the financing, and the third is the execution, whereby companies successfully invest capital and build profitable growth. One thing is certain: Unless the various belligerent powers around the world can find accommodation, this industry is set for a multi-year trend of high expenditure.

Which parts of the investment case appear to be underappreciated?

It seems that investors have gravitated to the traditional beneficiaries, the large, mainly Western firms that are well-established suppliers to NATO armies and US allies.

Three elements of the investment case appear to be mispriced.

- The **magnitude** of the public and private sector capital expenditure in defense. Many countries are still in the process of reviewing their defense architecture in the light of lessons learned in Ukraine and the Middle East. This process will result in a new set of priorities and requirements to suit modern asymmetric warfare, across multiple domains. It seems prudent to assume that the amount of capital investment will be significantly higher than currently expected.
- The **longevity** of this investment theme seems underappreciated. The combination of changes in capabilities that militaries now require to defend their countries is enormous in scale and in reach, which implies a decades-long runway.
- The **wide range of opportunities** for investors. As the template defense structure changes, so does the definition of the defense industry. The range covers both the traditional (non-proscribed armaments) and the exciting new technologies (LEO Satellite mapping/communications, artificial intelligence (AI) enhanced data management programs, etc.). Much of this will doubtless be transferred to civilian applications. Finally, there is a group of companies in a variety of geographies (South Korea, India and Japan) that stand to benefit from this investment theme

To gain exposure to the fastest-growing, higher-value segment of the sector, dual-use technologies, communications resilience, innovative unmanned vehicles, and high-specification missile defense capabilities are the main areas to focus on. In these areas, there are few "pure play" vehicles in the public markets, so private equity or direct participation in real assets appear the most promising in the long term.

The ESG conundrum and real-world solutions

It seems obvious that a desire to invest along ESG lines is absolutely at odds with a desire to invest in defense, but the aggressive Russian war of attrition on Ukraine has given stakeholders reason to consider their options, and there are signs that asset owners are following three broad types of approach: government bonds, standard rules and real assets/infrastructure.

The **government-bonds** approach is to invest in government bonds, thus supporting government funding, which otherwise may not be able to issue adequate debt. The reasons may include an already high debt/gross domestic product (GDP) ratio or a high debt service cost on existing debt, or weak economic growth and weak tax collection. Another practical issue is that most countries cannot create separate accounts to ringfence the proceeds for any specific purpose, and elected representatives must approve spending decisions.

The **standard-public equity-rules** approach is widespread, because it refers to the asset owner's existing responsible investment rules, which often allow defense investment, with certain exclusions around types of weapons. These are clearly defined in international treaties[6] and include nuclear, biological, chemical weapons and landmines, cluster munitions, incendiary bombs, etc. Many pension funds already own equity in defense firms within their own permissible investment universe.

The **real assets/infrastructure** approach is gaining interest. PensionDanmark is part of a consortium that has a contract with the Danish Ministry of Defense Acquisition and Logistics Organization to design new patrol ships for The Royal Danish Navy. PensionDanmark is providing finance to a newly formed consortium, Danske Patruljeskibe K/S, comprising defense group Terma and ship designers Odense Maritime Technology (OMT).

Recently there have been searches by asset owners inviting proposals for investment mandates for the defense sector using **private equity**. Global Fund Search, the Danish institutional platform, published one such search in August 2024 for €40 million to €75 million. Given the number of new small- and medium-sized companies with exciting technological projects, this area will probably grow in importance.

All these approaches are valid, but we must not forget that there is a significant and growing universe of companies that do not produce weaponry but will likely benefit from the enormous waves of investment over the next decades—companies we call dual use. All asset owners and professional investors can achieve exposure to some of the highest-priority defense spending by investing in the dual-use technologies which reflect the real transformation of the "new" defense industry. These are priorities because they cover asymmetric warfare, which most militaries are unprepared for. They include cybersecurity, low Earth-orbit satellite communications, unmanned drones for air, surface and underwater surveillance, and reconnaissance and mine clearing, to name only a few. As the increased investment in defense is designed to prepare for modern asymmetric warfare, so is investment in military research and development (R&D). This trend means that these capabilities will develop faster, resulting in innovations that can easily transfer to civilian applications. Further along the line, they may find their way into a variety of economic sectors, driving productivity longer term.



The paradoxical trinity

Carl von Clausewitz[7] famously wrote about the "***Paradoxical Trinity of War***." He explained that war is an instrument of policy, made up of the tendencies of the people, the commander and his army, and the government, to whom the military is subservient. It is paradoxical because while war is an extension of policy—a rational tendency—it is propelled at times by primordial violence and hatred—irrational tendencies—or simply by chance. So, it is a complex adaptive system with a non-linear progression that leads to unpredictable outcomes. Attempting to use one's understanding of only one or two of these elements, or to presume a hierarchical relationship between them, would be useless.

For investors, today's equivalent "*Paradoxical Trinity*" is composed of the **opportunity** (predictable and long-term commitments to increased defense spending by countries), the evident conflict with **ESG** commitments, and the radical transformation of the new "**defense industrial complex**."

Since the end of the Cold War, the defense industry has consolidated, and the smaller number of bigger players has led military procurement toward an ever-more technologically advanced and ever-more expensive toolkit. This process has left a vacuum in the "plain vanilla" segment of artillery shells, but more importantly, ignored the effectiveness and widespread adoption of asymmetric warfare toolkits. This explains the recent change of direction in NATO and the EU. There is an acceptance of the historically weak position member-countries are in, and the actions and the urgency required to address this weakness. But most importantly, there appears to be a mindset change in terms of adopting coordinated procurement processes, building a complementary domestic defense industry, and seeking out new innovative technologies.

The recent abrupt change in perceptions around Europe's vulnerability to a potential Russian attack has forced a review of long-held assumptions around the need for physical security over social security and serves to exacerbate the debate around a combination of competing social, economic, geopolitical and governance pressures.

Of ploughshares and swords

"The world is as dangerous as it has been for generations. And Europe is in the middle of it. This is why it is time for a European awakening on defense and security. Our freedom and our prosperity depend on our security. And we must bring our actions in line with the changing security environment."[8]

EU Commission President Ursula von der Leyen, April 17, 2024

For most of the last four decades, investors have enjoyed a giant convergence trade. It was a convergence of economic policy direction, which led to a convergence of generally lower inflation and interest rates—generating higher trend economic growth rates—primarily through increasingly free-wheeling globalization and free trade. The trigger for this benign cycle was a generalized geopolitical view that the Cold War was over for good, and most could benefit. We did not question the long-term sustainability of this wonderland, because we believed that economic growth could appease even longstanding ethnic/territorial resentments.

A key driver of the ensuing lack of interest in defense has been the widespread belief that globalization's benefits, via contributions to prosperity and economic growth, had succeeded in establishing a new paradigm whereby war was unnecessary and states could simply focus on economic development. This change of paradigm was captured by Francis Fukuyama's 1989 essay, "The End of History."[9]

Europe in particular has enjoyed a peace dividend over the last 35 years. This has enabled the growth of the EU project and improved citizens' lives economically, socially and qualitatively, while making significant strides toward a restructuring of the continent's energy infrastructure, making it "green" and helping to alleviate the impact of climate change. Now we are in an asymmetric, multi-layer undeclared "Cold War II." Around the world, armed conflicts have been spreading geographically. From Libya, Syria, Gaza, Israel, Lebanon and Yemen, to Ethiopia, Sudan, the Sahel, Russia, Ukraine, Nagorno-Karabakh and Myanmar. There are few signs of negotiated settlements because the aggressors are committed to an all-or-nothing approach and the defenders are not yet exhausted. In areas of bubbling tensions, other leaders are watching, waiting for their own opportunity to act. Everyone is watching the conflicts closely to learn from them, in terms of what works and what does not.

Investors understand how the defense industry in the West changed its modus operandi in the 1990s. It was no longer important to build stockpiles of ammunition and hardware. Just like the automobile sector, companies moved toward a just-in-time model, selling surplus land and buildings and reducing their production capacity. Fewer product ranges and a focus on more sophisticated, big-ticket items like stealth fighter jets squeezed out plain vanilla products at home, making export orders even more important to keep the (diminished) factories open. Now, having provided significant aid in kind to Ukraine in the last three years, the cupboards are bare, and the situation is urgent.

A complicating factor is that most of the material sent to Ukraine is old production, using designs from 50 or more years ago. Replacing this inventory is not straightforward; it implies restocking of munitions, but also deciding on new platforms suitable for the future, while also setting the conditions for a purely European supply chain to guard against sabotage or excessive dependence on foreign suppliers. This means the priority level for policymakers is high, and given the stretched balance sheets of certain countries, there will be a concerted effort to attract private sector investment. This will be done by encouraging commercial banks to participate in funding the sector, providing long-term orders and capital expenditure incentives for company managements, and gently nudging large pools of savings, such as pension funds.

This is not an exclusively European problem. In the United States, the National Defense Industry Association (NDIA) flagged significant constraints that its members have reported. It seems that 34% feel that availability of skilled labor is a significant concern, followed by availability of materials (21%).[10] Such constraints are likely similar for European manufacturers.

It is often said that generals begin wars using the last war's tactics. But armies also innovate and adapt. In the current environment, military strategists are monitoring all current conflicts as real-time laboratories to learn which tactics work better and how well particular equipment responds to the reality of battle. In the same way as China's PLA[11] modernization was designed with the observations of the US Persian Gulf Wars in mind, NATO forces are learning from Ukraine and Gaza and refining their list of requirements for the next decade. This process is disrupting established procurement plans and revealing new areas of importance and by extension, of investment.

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The investment opportunity

The last time a defense stock was among the top 10 performers of the S&P 500 Index was in the 1980s. These new developments have reopened an investment opportunity in the defense sector. The commitment by European NATO members to invest over US$400 billion annually[12] for at least the next decade is just the start, as the recent growth in the number of private equity and public markets mandates suggests. Defense spending in 2023 reached its ninth successive annual record, totaling US$2.4 trillion.[13] This amount represents a 36% increase over the last decade. Over the next six years, NATO spending alone is estimated at US$8.9 trillion, of which US$3.2 trillion is from European NATO members and Canada.[14] It works out to be around US$500 billion a year, rising to US$600 billion in 2029.

The numbers look big and there is some opposition to them, often because of the assumption that these monies will force a reduction in social welfare. For perspective, it is worth remembering that the EU's post-pandemic recovery fund, called the NextGenerationEU, was €806.9 billion (US$900 billion), equating to approximately 5% of the EU's GDP at the time.[15]

Exhibit 1: NATO Members Future Defense Expenditures as Percent of GDP vs. GDP Growth Projections

	Defense Expenditure as % GDP			GDP Growth	
Country	2024 (est.)	Projections	As of	Projections	As of
Albania	2.03%	2.21%	2025	3.40%	2025
Belgium	1.30%	2.00%	2035*	1.71%	2035
Bulgaria	2.18%	2.40%	2026*	2.90%	2026
Canada	1.37%	1.76%	2029-30	1.70%	2029
Croatia	1.81%	2.00%	2027*	2.60%	2027
Czechia	2.10%	2.00%	2025*	2.00%	2025
Denmark	2.37%	2.40%	2025*	1.50%	2025
Estonia	3.43%	3.03%	2027	1.90%	2027
Finland	2.41%	2.00%	2026-27	1.70%	2027
France	2.06%	3.00%	2030*	1.30%	2029
Germany	2.12%	2.00%	2025-26	1.50%	2026
Greece	3.08%	3.50%	2024-25*	1.90%	2025
Hungary	2.11%	2.50%	2025*	3.30%	2025
Iceland	NA	0.01%	2024**	1.70%	2024
Italy	1.49%	2.00%	2028*	0.80%	2028
Latvia	3.15%	3.00%	2026*	2.50%	2026
Lithuania	2.85%	3.00%	2025-30	2.20%	2029
Luxembourg	1.29%	2.00%	2028* ***	2.30%	2028
Montenegro	2.02%	2.00%	2025-29****	3.00%	2029
Netherlands	2.05%	2.22%	2026*	1.90%	2026
North Macedonia	2.22%	2.00%	2025-29	3.50%	2029
Norway	2.20%	2.68%	2030	1.40%	2029
Poland	4.12%	3.00%	2025-27	3.00%	2027
Portugal	1.55%	2.00%	2030	1.90%	2029
Romania	2.25%	3.00%	2025-29	3.50%	2029
Slovakia	2.00%	1.80%	2027	2.70%	2027
Slovenia	1.29%	1.36%	2025	2.50%	2025
Spain	1.28%	2.00%	2029*	1.60%	2029
Sweden	2.14%	2.60%	2030*	2.10%	2029
Turkey	2.09%	2.00%	2025*	3.20%	2025
UK	2.33%	2.50%	2030-31	1.40%	2029
United States	3.38%	3.00%	2025-26	2.00%	2026

Sources: International Centre for Defence and Security, IMF, OECD. Notes: *Data from secondary source (e.g., media report), rather than from a primary source (e.g., government publication, ministerial communication). **Civil defense. ***Percent of the GNP. **** It is assumed that Montenegro will maintain its current defense spending at 2% of GDP through 2029. There is no assurance that any estimate, forecast or projection will be realized.

According to the US Congressional Budget Office, US defense spending is expected to keep growing every year until 2034, when it will reach US$1.94 trillion.[16] The Russian government meanwhile has submitted its federal budget for 2025, according to which defense and security will account for US$185 billion, or 41% of the country's budget,[17] equivalent to over 8% of its 2023 GDP.[18]

There are some limitations in the simple comparative approach, because although the United Nations (UN), the International Monetary Fund (IMF) and NATO have set out standard definitions, governments are free to use their preferred methodology. NATO members follow NATO rules, including pensions, military schools, hospitals and UN peace-keeping missions. Within this, there are recommended minimum levels of expenditure for equipment purchases and for salaries and social security requirements. But countries with a reliance on conscripts tend to have lower salaries component, theoretically freeing up more money for equip-ment. The United States, for example, does not include Homeland Security (US$62 billion budget for 2025[19]) or the Department for Veterans' Affairs. EU member states do not include civil defense or defense R&D.

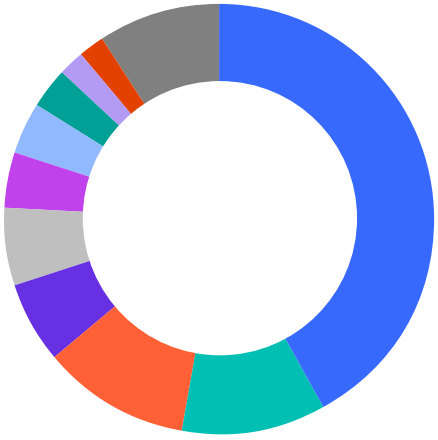
Exhibit 2: Largest Importers and Exporters of Arms

Global Share of Imports of Major Arms
The top 10 largest importers, 2019–2023



India	10%
Saudi Arabia	8%
Qatar	8%
Ukraine	5%
Pakistan	4%
Japan	4%
Egypt	4%
Australia	4%
S.Korea	3%
China	3%
Others	47%

Global Share of Exports of Major Arms
The top 10 largest exporters, 2019–2023



US	42%
France	11%
Russia	11%
China	6%
Germany	6%
Italy	4%
UK	4%
Spain	3%
Israel	2%
S.Korea	2%
Others	9%

Source: SIPRI Yearbook 2024.

Elsewhere, the forecast spending on defense is steadily climbing. India plans to reach a cumulative US$445 billion by 2028.[20] China's defense budget for 2024 was US$471 billion,[21] compared to US$298 billion spent by all other Asian countries, according to the International Institute for Strategic Studies (IISS). The increasing assertiveness of the Chinese military, Navy, Coast Guard and Air Force is driving a real-term annual growth in defense spending of 6% per annum compared to 3% for the rest of Asia since 2014.[22]

In Latin America, the intraregional security situation is relatively benign, but governments are beset by transnational criminal organizations, localized criminal gangs and some insurgent groups. In countries like El Salvador, Honduras, Nicaragua, Colombia, Mexico and even Brazil, the exceptional reach, wealth and equipment of the criminal networks puts increasing pressure on their societies and state capacities. In this environment, militaries are used to complement law enforcement. The implication is that the procurement focus is on interdiction, counter-insurgency and surveillance, rather than warplanes. Brazil and Venezuela lead the region, with defense budgets of US$24.8 billion and US$24 billion respectively, followed by Mexico (US$14.8 billion) and Colombia with US$14 billion. Other national military budgets are between US$2 billion and US$3 billion each.[23]

In the past, European spending would not only be lower, but significant parts of it might be spent on large-scale prestige projects, like a new generation of fighter jets, with a tendency to finish late and over budget. Looking forward, there is a concerted effort to incentivize cooperation, coordination, pooling of R&D, and to involve highly skilled small and medium enterprises.

Underlining this effort, the European Commission (EC) has actively encouraged a variety of initiatives including the Defense Equity Facility ($560 million)[24] as well as incentives and funding to promote investment in the European defense industrial sector. The European Defense Fund (EDF) has a budget of US$9 billion for the years 2021-2027, of which US$3 billion is earmarked for collaborative defense R&D and US$6 billion for collaborative capability development projects that complement national contributions. These monies are particularly targeting small- and medium-sized companies and are rewarding links to existing priority defense themes. The focus on collaboration is deliberate, to incentivize standardization and interoperability, and eliminate duplication. The objective is also to build long-term order books, as these will encourage companies to invest in higher capacity, thus lowering costs and increasing efficiency.

European armies are low on inventory because they have given significant material aid to Ukraine to help the country fight Russia; however, most of the material sent to Ukraine is old production, using designs from 50 or more years ago. Replacing this inventory is not straightforward; it requires restocking and prompts decisions on new platforms suitable for the future, while also setting the conditions for a purely European supply chain to guard against sabotage or excessive dependence on foreign suppliers. This means the priority level for policymakers is very high, and the finance will likely not be a problem.

In the short term, munitions will dominate demand as NATO forces rush to increase their stockpiles. For context, some countries' inventory stands at 3-5 days' worth, while NATO standards for high intensity combat are for 30 days. BAE Systems has announced it will increase production capacity of 155mm artillery shells eightfold by 2026.[25] The company is now in year three of a 15-year £2.4 billion contract for the supply of munitions to the British Army.[26]

There is a clear commitment to develop a large-scale, effective EU defense industry, which arguably bodes well for economic activity on the continent, as increased investment (Keynesian theory) leads to higher output and higher employment, generating higher short-run growth rates. But this is true if aggregate demand is lower than potential supply, which would generate inflation. The opposite view holds that any investment in defense is negative because it crowds out other public investment and could fuel inflation. It seems reasonable to assume that the negative effect depends on how the new military spending is financed and the extent of private sector involvement. Interestingly, Churchill and Yew (2018) conducted a meta-analysis of empirical literature and found that the positive effects of increased defense spending were more pronounced for developed countries than for less-developed ones. This difference could be attributed to the typically high levels of corruption or simply bad governance, which typically leads to poor value for money and inappropriate investments in developing countries that lack institutional strength.

How will this be financed?

The short answer is that the large sums involved imply a role for the private sector, as well as government. In most countries, this is a straight public-private partnership (PPP), which can be structured in a variety of ways, from Design, Build, Finance, Operate, Maintain (DBFOM) to Build, Operate, Transfer (BOT), but the key factor tends to be how the private sector party gets remunerated. Is the government the only source of revenues? Or is the partnership able to find buyers outside the government? The example of PensionDanmark's consortium[27] to design and build new patrol boats for the Danish Navy is instructive, as is the approach taken by the Mutual Military Aid Association (MMAA), the South Korean pension fund for military personnel. MMAA has set up a US$60 million blind pool fund[28] to invest in defense and technology, along with LIG Nex1 Co and IBK investment bank. The fund will invest in domestic companies in AI, robotics, unmanned transportation, aerospace, semiconductor, advanced materials and other sectors.

"PPP: A long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance."

UN Trade & Development (UNCTAD)[29]

There is slightly different wording used by the EU, the multilateral development organizations and academics, but the basic lines are the same: These are long-term (30 years), cooperative projects between the public and private sector, whose objective is to provide a public asset or service and sharing of risks, responsibilities and rewards.



Germany's emblematic Zeitenwende[30] is about changing attitudes first



It's all different now, as Chancellor Olaf Scholz said in his address to the Bundestag, the German parliament, three days after the beginning of the Russian invasion of Ukraine. He said we were living through a Zeitenwende, or a "turning point in time," demanding radical action such as an urgent investment in the armed forces. Western allies were delighted, because they interpreted this to mean Berlin was getting serious about re-arming. However, as the glacial pace of change has demonstrated, no radical change is possible without a radical rethink by Germans, of Germany's place in geopolitics and geoeconomics.

On the geoeconomics front, the coalition government has delivered, reducing its dependency on Russian natural gas and diversifying energy sources, advancing into renewables in the process. Support for Ukraine has also come through in financial aid, while only gradually in military aid. This is probably down to Scholz's Social Democratic Party (SPD), and its long-established policy of reconciliation and objections to nuclear missiles on German territory or sending weapons to war zones.

There have been plenty of critics pointing to unmet promises on defense spending, but arguably progress is happening, just at a slower pace than allies would wish. New Defense Minister Boris Pistorius has impressed, but he is not the Chancellor. And outdated procurement regulations and requirements for parliamentary approval have meant that only a fraction of the €100 billion defense fund has been drawn down and the Bundeswehr (German Armed Forces) is still below strength, with 21,000 vacant positions.[31]

All of this has led to a deterioration in relations with NATO allies, who demonstrate quicker decision-making, none more so than Poland, whose government has become a strident voice in EU security, defense and foreign policy matters. The German government's new National Security Strategy identifies Russia as "the most significant threat to peace and security in the Euro-Atlantic area"[32] and calls for an integrated defense within NATO but also an integrated "all of society" effort to raise resilience to asymmetric warfare, such as cyberattacks and disinformation, which requires the public to be brought along. Next year, there are elections in Germany. Just like most democracies, the traditional parties appear weak and there is a vacuum available to opportunistic populists. The rest of Europe is watching and hoping that the Zeitenwende happens quickly.

The opportunity: Government action and private sector engagement

The Russian war on Ukraine has forced the world, and especially Europe, to recognize that building and maintaining a credible deterrent also requires the logistics and manufacturing base to match. In recognition of the decades-long neglect of the European defense industry, the European Commission (EC) has set out its first European Defense Industrial Strategy (EDIS),[33] with an emphasis on enhancing the EU's defense readiness and strengthening its defense technological and industrial base (EDTIB). There is a new regulation[34] to pick up from the short-term, emergency measures that were adopted in 2023, including common procurement financing, and to implement the concrete measures in the EDIS.

The ambition of the new European Defense Industrial Strategy is revolutionary

Given the EU's original objectives were to end the historically frequent and regular wars in Europe via economic cooperation, it should surprise no one that the defense sector was fragmented. Apart from good work to ensure interoperability with NATO (and by default, with the United States), significant duplication and inefficiency in the defense industry remains. So much so that between 2021 and 2022, only 18% of the total equipment investment in Europe was collaborative.[35] EU members typically do not coordinate their defense planning and procurement, leading to suboptimal investments. The new European Defense Industrial Strategy, announced in 2023, seeks to address all that and prepare the EU for a world where European armies shoulder the responsibility for the continent. It identified investment, capability and industrial gaps and seeks to achieve commonality in standards and mutual recognition of certifications as well as to prioritize the security of supply chains and technologies, as evidenced by the monitoring of components and supply routes. With the recognition of the importance of building a large-scale defense technological and industrial base, these are the key elements of the European Defense Industry Program (EDIP):

- Enhanced coordination: Establishes a Defense Industrial Readiness Board to coordinate and streamline Member States' defense needs and procurement plans.
- Increased investment: Encourages member states to invest more in defense, targeting critical capabilities and infrastructure.
- Industrial readiness pools: Supports the creation of strategic reserves of defense capabilities to ensure quick availability.
- Standardization and certification: Promotes the use of common standards and mutual recognition of certifications to improve interoperability and efficiency.

Just as in other areas of industrial policy, there are significant positive impacts on EU member states, especially the increased defense readiness, improved security of supply, and higher effectiveness of procurement and promotion of EU suppliers to encourage private sector investment in capacity growth. Within that preference for domestic producers, there is also a clear emphasis on encouraging small- and medium-sized enterprises to promote innovation and competitiveness; this is aimed at facilitating higher R&D spending and is particularly interesting in the relatively new areas of AI-powered command and control, communications, or specialist drone production.

There are concrete targets for member states, incentivizing collaborative procurement (40% by 2030), with at least 50% of this procurement within the EU by 2030, rising to 60% by 2035. Finally, there is a commitment for at least 35% of the EU defense market value to be intra-EU defense trade by 2030.

Government action in Europe is collective

This theme of increased collaboration and coordination in defense is still ongoing, but there have been two significant successes already in the areas of air mobility, including transport, air-to-air refueling and medical evacuations. In 2010, seven countries (Netherlands, Belgium, France, Germany, Luxembourg, Spain and Italy) pooled their assets (over 150 airplanes) and created a joint command to serve their needs. It is the **European Air Transport Command** (EATC)[36] and is headquartered in the Netherlands. Others may join as the benefits of joint procurement and interoperability are clear.

A more recent development is the **European Sky Shield Initiative** (ESSI),[37] which Germany launched in August 2022 and now counts 22 members (Austria, Belgium, Bulgaria, Czechia, Denmark, Estonia, Finland, Germany, Greece, Hungary, Latvia, Lithuania, Netherlands, Norway, Poland, Romania, Slovakia, Slovenia, Sweden, Switzerland, Turkey and the United Kingdom). The move by hitherto neutral Austria and Switzerland to join may lead to future questions around their alignment.

The Sky Shield partners have followed Germany's lead to focus on three products:

- Medium range (up to 35km): The chosen system is IRIS-T SLM, which is a German system
- Long range (up to 100km): The Patriot system, manufactured by RTX, Raytheon, and Lockheed Martin in the United States. (Patriot stands for Phased Array Tracking Radar for Intercept on Target)
- Very long range (>100km): The Arrow 3, manufactured by Israel Aerospace Industries (IAI)

However, there are detractors. France and Italy co-produce an alternative to the US Patriot system, called SAMP/T. It is half the price of the Patriot, has similar range (up to 100 km) but carries two missiles compared to Patriot's three to six missiles. Germany doubled down on the US system after seeing how effective it has been in Ukraine against Russian ballistic missiles, which are faster than cruise missiles. The math looks compelling:

- A Patriot system costs US$1.1 billion, and each interceptor missile costs US$3.8 million.[38]
- SAMP/T costs US$500 million per battery and US$2 million per Aster-30 interceptor missile.[39]

In the spirit of the new EDIS however, there may be a renewed push to choose the SAMP/T solution longer term. Another reason to switch is that Lockheed Martin says it will struggle to make 650 units per annum by 2027,[40] and there is no guarantee that ESSI will get priority.

The latest development is the selection of 54 additional EDF projects for funding worth €1 billion,[41] which may bring the total EU budgetary investments to more than €3 billion in collaborative defense R&D projects since the start of the EDF Regulation in May 2021. The winning proposals respond to the funding priorities of the 2023 EDF work program, addressing 34 topics structured along four thematic calls for proposals, plus bottom-up calls focused on small- and medium-sized enterprises (SMEs). These projects will support technological advances across a wide range of defense capability domains, including cyber defense, ground, air and naval combat, protection of space-based assets or chemical, biological, radiological and nuclear (CBRN) defense. For the first time, four of the chosen projects aim to transfer civil innovations to defense, and there is technical and financial support for 60 startups and SMEs in the initial phases. SMEs represent 42% of the entities chosen and 18% of the funds requested. The process focuses on pooling talent when it comes to R&D, targeting priorities commonly agreed to with member states. It fosters a more integrated and capable European defense technological and industrial base, and it promotes interoperability of National Armed Forces by reducing duplication.

The latest development is the selection of 54 additional EDF projects for funding worth €1 billion, which may bring the total EU budgetary investments to more than €3 billion in collaborative defense R&D projects since the start of the EDF Regulation in May 2021. The winning proposals respond to the funding priorities of the 2023 EDF work program, addressing 34 topics structured along four thematic calls for proposals, plus bottom-up calls focused on SMEs.

Government initiatives are multiplying—and converging

The parliament of the **Netherlands** is considering a new "Defence and Security-Related Industry Resilience Act" ("Defence Resilience Act") directed at companies active in these industries, and it contains provisions aimed at improving Dutch armed forces operations. The act introduces a new sector-specific foreign direct investment (FDI) screening mechanism, lays out a framework for certifying Dutch companies to compete for foreign defense contracts, and draws up measures to enhance the Dutch defense industry's production, innovation and international competitiveness in general. Companies active in defense and security-related sectors can expect changes in merger and acquisition processes, new opportunities for international contracts, and a stronger regulatory framework that aligns with EU, US, and Canadian standards. This could lead to increased economic activity coupled with more regulatory hurdles and government supervision.

The **French** government has increased the next five-year defense budget by 40% and the armed forces are using it to reshape their force design. The observations of the war in Ukraine have triggered new thinking around priorities and the pace of deliveries. The Ministry of Defense is collaborating directly with suppliers to speed up deliveries of certain platforms and stagger others, to remedy weaknesses highlighted by the war in Ukraine. There is a recruitment drive to add 28,300 personnel,[42] but there will be a net reduction in infantry and a net increase in specialist units, with a focus on intelligence, communications, cyber, drones, robots, missile defenses, longer- range missiles, satellite observation and special ops units. Finally, there will be increased investment in the infrastructure of military bases in French overseas territories, which are in sensitive areas of the Indian and Pacific Oceans. There will be no more large-scale commitments in Africa after the coups d'états in the Sahel region which resulted in ruptured relations with France.

The country with one of the most successful histories of industrial policy guidance, France, has a long-established expertise in a variety of defense subsectors, via Airbus, Thales, Dassault, CEA and Naval.

The **UK** government set out reforms in the Procurement Act 2023,[43] which introduces a single system for public procurement, repealing and replacing several regulatory systems. The act was expected to come into force in October 2024, but that was postponed until February 2025, so that the new government can produce a new national procurement policy statement that reflects its priorities for public procurement. New regulations will be laid to bring the new date into effect.

For context, the new UK government has a three-phase strategy to bolster ties with the EU that calls for restoring trust in the United Kingdom after an antagonistic relationship during the Conservatives' 14 years in power, defining common interest policy areas and agreeing on detailed policies. The government hopes a deal on security, with the United Kingdom bringing to the table its heft on defense and intelligence, will facilitate a deal to reduce trade barriers. So, there is an expectation of significant coordination and cooperation in defense.

In 2021, the United Kingdom published its first "Defence and Security Industrial Strategy (DSIS),"[44] which aims to establish a more productive and strategic relationship between government and the defense and security industries. In support of those industries, investment from overseas is explicitly welcomed to build capacity, introduce new technology and techniques, and generate employment. The MOD will invest a total of over £85 billion on equipment and support in the next four years. It is expected that increased investment in R&D and close collaboration with industry will enable experimentation and bring new and emerging capabilities more rapidly into service, creating military advantage and economic opportunity.

The United Kingdom has committed to this politically and is promoting it with the public as part of a drive for national security in its traditional sense, and the economic growth which both underpins and depends on that security.

The parliament of the Netherlands is considering a new "Defence and Security-Related Industry Resilience Act" (Defence Resilience Act) directed at companies active in these industries, and it contains provisions aimed at improving Dutch armed forces operations.

The ESG conundrum

"The recent European fiscal efforts to address the COVID-19 pandemic and the energy crisis were much more significant than the type of effort required today for defense. This would not present a dramatic 'guns versus butter' or 'welfare versus warfare' dilemma, even if it would require a deliberate and sustained prioritization."

Camille Grand, Senior Policy Fellow at the European Council on Foreign Relations[45]

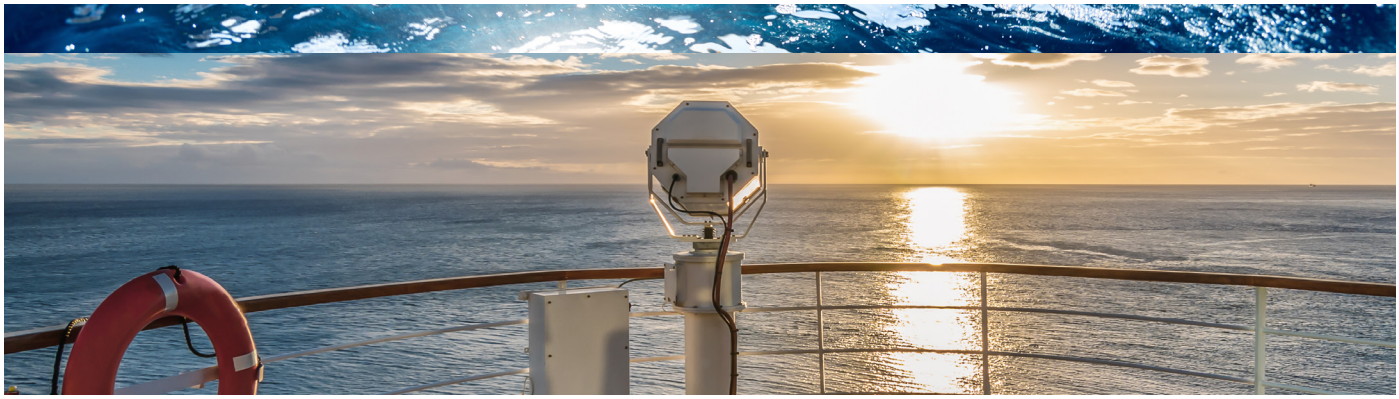
The growth of ESG investing around the world has been exceptional, seeking to "do no harm" and to help set the conditions to deliver the UN Sustainable Development Goals (UN SDGs). There appears to be a parallel with the "end of history" theory.

It seems obvious that a desire to invest along ESG lines is absolutely at odds with a desire to invest in defense, but the aggressive Russian war of attrition on Ukraine has given stakeholders time to consider their options and the signs are that even the most committed ESG investors are looking at the sector again. Clearly, a robust military deterrent is a key factor in ensuring peace. This deterrent naturally requires significant financing and governments have been quick to do their part to encourage investment in the defense sector.

Traditionally, asset owners with ESG principles shunned all defense companies, along with all fossil fuel companies, regardless of their intrinsic worth. Today, the mood music has changed, forced by the Russian aggression on Ukraine, and most pension funds in Northern Europe have pivoted to accept the need for investment in defense for the national interest.

Alecta, Sweden's largest pension fund with around €100 billion under management, states that it can invest in the defense sector with relatively few restrictions, as laid out in the below passage in its Responsible Investment Policy document.[46]

"Alecta does not invest in companies whose business, directly or indirectly, includes controversial weapons. These are weapons that, because of their effect, cannot be used under international law, either because they affect civilians and soldiers indiscriminately or because they cause unnecessary suffering. These include anti-personal landmines, biological weapons, chemical weapons, cluster munitions, incendiary bombs, laser-blinding weapons and weapons containing non-detectable fragments." - Alecta Responsible Investment Policy, December 16, 2021



Norges Bank Investment Management, one of the largest sovereign wealth funds globally (€1.1 trillion), states:

> **"According to the guidelines, the fund must not invest in companies which themselves, or through entities they control, manufacture weapons that violate fundamental humanitarian principles through their normal use or sell weapons or military material to certain countries."[47]**

Investing or not investing in defense is an internal discussion for each asset owner. The investment and ethical beliefs of the investor cannot supersede those of their stakeholder group. Some investors will have clear fiduciary responsibility to principles that preclude this type of investment and will be truly clear about what they can and cannot do. Others may be more able to align with government policy, if one emerged. Unsurprisingly, there is a wide range of investment policy in evidence today, with a range of speeds of implementation.

Pension funds are designed to do what it takes to secure retirement for their members. To fulfill their mission, they have already reoriented their investment policies toward sustainability. But they cannot stop climate change alone, and they cannot be held responsible for the lack of investment in the European defense industry. It falls to EU governments to provide the basis for greater involvement of pension fund capital. In some cases, this appears to have been remarkably consensual, with pension funds working closely with the national defense industries to increase production and embark on new capabilities.

A great example is provided by **PensionDanmark** in Copenhagen, which is directly involved in two major Defense-related projects. The first project is a straightforward real estate investment, along with construction engineering firm MT Hojgaard Holding and property management company DEAS Group, to construct and operate new headquarters for the Danish Defense Intelligence Service.

The second is more unusual: It is part of a consortium that has a contract with the Danish Ministry of Defense Acquisition and Logistics Organization to design new patrol ships for the Royal Danish Navy. PensionDanmark is providing the finance to the newly formed consortium, Danske Patruljeskibe K/S, comprising defense group Terma and ship designers Odense Maritime Technology (OMT.) The trio's first customer is the Danish Ministry of Defense Acquisition and Logistics Organization (DALO). There has been an order from the Norwegian Navy,[48] and the consortium hopes to begin building military vessels for other countries' navies, too. Separately, the pension fund also holds plain vanilla equity in big global defense names like RTX and BAE Systems.

By looking at the issue through the lens of **real assets**, it can be argued that just as investing in water-treatment plants, hospitals and social housing contributes to the sustainability of society and human life, there is an opportunity to help ensure the sustainability of liberal democracy via supporting critical defense infrastructure.

European pension funds have been moving to clarify their stance on investment in the defense industry. Certain Nordic pension funds have moved quickest, clarifying a pragmatic approach in the years since Russia's annexation of Crimea and the start of its war with Ukraine.

In the Netherlands, the pension fund industry and the government seem to be talking past each other and the argument is playing out in the media, potentially damaging relationships in the process.

> **"If governments need money to finance weapons, they can issue a government bond that pension funds and other large investors can invest in. We are always ready for a constructive discussion on this with the Ministry of Defence."[49]**
>
> Harmen van Wijnen, CEO, ABP[50]

Investing in military capability will come down to an investor's investment beliefs and their stakeholder group. Some investors will have clear fiduciary responsibility to principles that preclude this type of investment and will be truly clear about what they can and cannot do. Others may be more able to align with government policy, if one emerged.

The defense industry has changed

"The defense industrial base today is more global, more commercial, and more financially complex than it was in the past. The defense industry, from the prime contractors that work directly with the government to their subsystem and component suppliers and even their raw materials suppliers, is constantly changing, constantly adapting to the Department's requirements and to the conditions in the marketplace. This natural evolution in the base is inherent in a free enterprise system, but it can bring with it new challenges for a Department of Defense that seeks to sustain and grow a strong defense industrial base even as budget growth declines."[51]

Frank Kendall, Principal Deputy Under Secretary of Defense for Acquisition, Technology, and Logistics

Today's defense sector looks quite different from the one that we knew in the 1980s. At that time, there were estimated to be more than 3,000 companies in what was known as the "military-industrial complex" and tenders often received hundreds of proposals. Today the sector has consolidated, with contracts tiered by specialization as well as by geography. There are very few companies that can supply high-ticket, high-specification hardware. The primary contractor for the F35 fighter bomber is Lockheed Martin, with principal partners Northrop Grumman and BAE Systems. There are of course small but specialized components made by NATO-partner countries. For example, Leonardo of Italy produces the laser targeting for the F35 in Edinburgh, United Kingdom. Raytheon makes missiles, sensors and air defense systems. Huntington Ingalls Industries builds most of the US Navy surface fleet of all classes, as well as nuclear submarines.

When it comes to the newer defense capabilities, there is a plethora of companies, some very large (Microsoft) which provide cutting-edge defense capabilities against cyberattacks, and others small (QinetiQ[52]), which provide military robots, risk evaluation across air, land and sea, and cybersecurity. The US Department of Defense has a long-established focus on contracting with smaller companies to try to lock in new technologies (see Appendix IV).

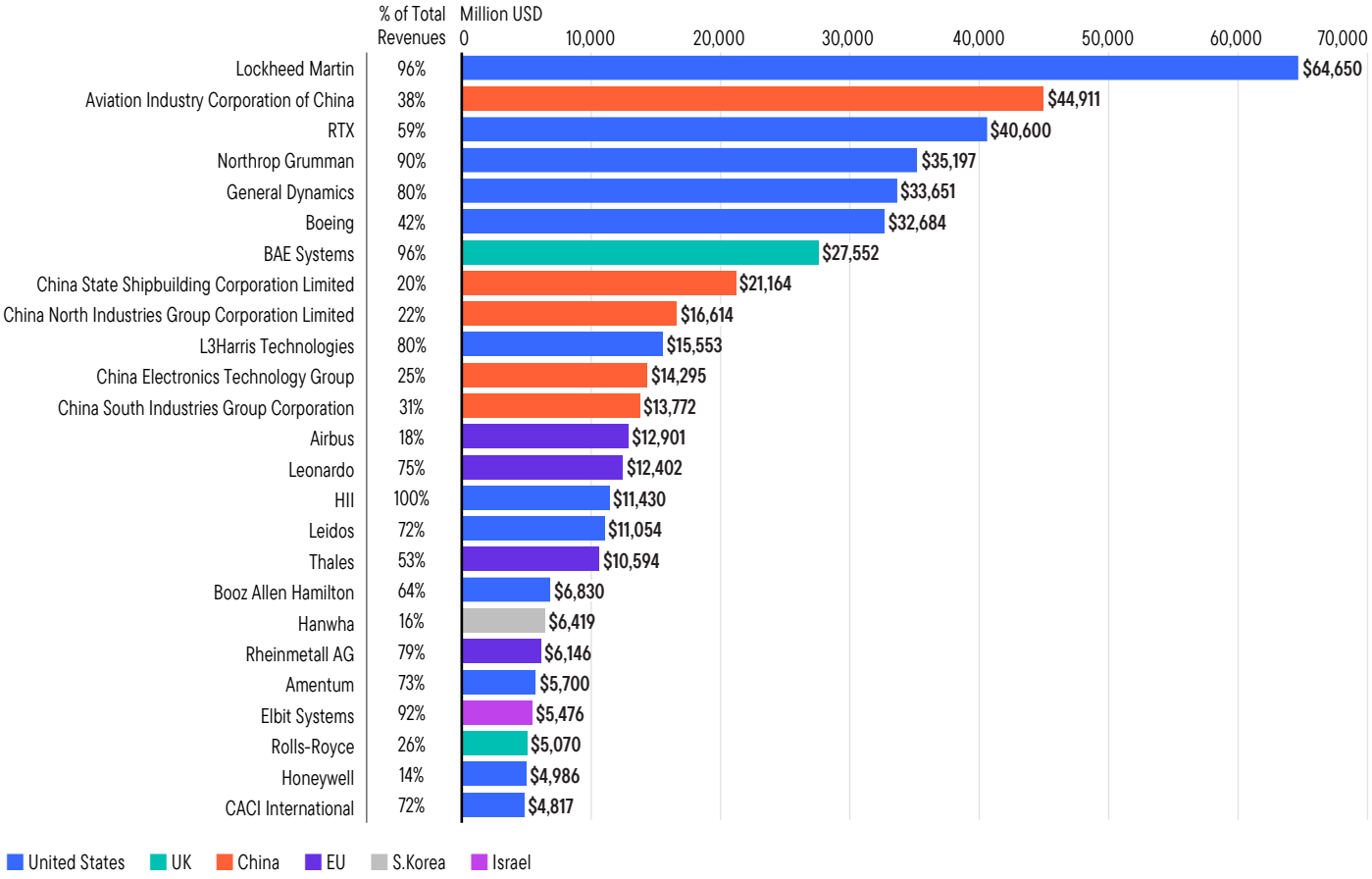
The investment universe provided by the "new look" defense sector is significant; one of the lessons of Ukraine's war is the importance of low-Earth-orbit (LEO) satellite communications. Access to or denial of communications is critical in a war. Russia has launched cyberattacks, attempts to spoof, jam and hack satellite networks, sometimes successfully. For the US Department of Defense, this proves the value of Starlink[53] and Maxar.[54]



Exhibit 3: The United States and China Dominate Arms Production

The Largest Defense Companies by Defense Revenues[55]

As of 2023



Source: Defense News. Data as of 2023. Companies referenced for illustrative purposes only. Discussions should not be regarded as any type of trading recommendation, or as a signal about any past, current or future trading activity in any fund or strategy, by Franklin Templeton and its affiliates.

Since 1989, NATO armies have increasingly worked on standardization of equipment, training regimes and the level of interoperability, which demands flexibility and trust. But this focus on interoperability has not been matched by the member countries' coordination of capital expenditures in their defense sectors' manufacturing bases. Furthermore, there has been a tendency to buy American equipment, which tends to be more expensive.

The European Commission is guiding EU members (including those that are not in NATO, like Austria, Ireland, Cyprus and Malta) to join the European Defence Technological and Industrial Base (EDTIB) and to increase and coordinate defense procurement, in compliance with their commitments to the EU's industrial policy. This move to rebuild the European defense sector is boosted by significant long-term expenditure commitments, which will change the composition of the table in Exhibit 3 in the next decade.

In Europe, it is quite common to have government ownership in the principal defense sector companies. The Italian government owns 30% of Leonardo, the French government holds around 11% of Airbus and Safran as well as 26% of Thales. France and Germany each own 11% of Airbus, while Spain owns 6%. The UK government has a golden share in both Rolls Royce and BAE Systems, and it has a veto right over Babcock International's shipyards at Rosyth and Devonport, because they maintain much of the Royal Navy, including its Trident submarines. This should make it easier for these companies to develop long order books, justifying the capital expenditure necessary to increase production.

In the current environment, military strategists are monitoring all current conflicts as real-time laboratories to learn which tactics work better and how well particular equipment responds to the reality of battle.

Building defense industrial capacity abroad

The Danish Ministry of Defense (MoD), in collaboration with the Danish Defense Industrial Base (DIB), announced on September 29, 2024 the establishment of a defense industrial hub at the Danish embassy in Kyiv with the aim of enhancing Danish-Ukrainian defense industrial cooperation. The Danish initiative aims to support Danish defense and dual-use companies that want to establish production or partnerships with Ukraine. Ukrainian Defense Minister Rustem Umerov and Danish Defense Minister and Deputy Prime Minister Troels Lund Poulsen also signed a Letter of Intent on September 29 that pledges Danish financial support for defense production in Ukraine. Denmark will allocate a total of €575 million (US$641 million) for investment in the Ukrainian DIB, with €175 million (US$195 million) coming directly from the Danish budget and an additional €400 million (US$446 million) from profits from frozen Russian assets.[56] Ukrainian Defense Minister Rustem Umerov stated on September 14 that Ukraine will be able to domestically produce US$20 billion worth of defense equipment in 2025 if Ukraine receives additional funding from its partners.

Franco-German firm KNDS[57] has followed suit,[58] setting up a subsidiary in Ukraine to provide maintenance, repair and overhaul (MRO) as well as to build a manufacturing capability for 155mm artillery shells in a local joint venture. It seems likely that Ukraine will become one of the main centers for the NATO-compatible defense industry in Europe.

In June 2024, Hanwha Group of South Korea acquired Philly Shipyard in Philapelphia, Pennsylvannia. This acquisition puts Hanwha at the center of the US Navy's procurement plans, and adds capacity to the country's shipyards. The first contract is for maintenance, repair and overhaul (MRO) and will help cut down the Navy's current maintenance backlog. This yard has potential to do much more and represents the kind of FDI from allies with know how that Washington DC will welcome.[59]

Militaries are changing configurations of their forces (and suppliers) to maximize efficiency

In the current environment, military strategists are monitoring all current conflicts as real-time laboratories to learn which tactics work better and how well particular equipment responds to the reality of battle. In the same way as China's PLA[60] modernization was designed with the study of the US Gulf wars in mind, NATO forces are learning from Ukraine and Gaza and refining their list of requirements for the next decade. This process is disrupting established procurement plans and revealing new areas of importance and by extension, of investment.

One lesson of the war in Ukraine is that there is still a need for large quantities of relatively old tech consumables, like the 155mm artillery shell. The EU's defense industry has already increased its production capacity by 50% to 1.5 million per year and will be producing two million shells by the end of 2025.[61] For context, Russia is firing between 10,000 and 15,000 shells per day into Ukraine. The United States aims to reach output of 840,000 by the end of 2024 and 1.2 million by 2025.[62] The interesting aspect of the surge in production of the most-used artillery shell is the example of how the industry has changed its operating model.

In May 2024, the US Army's Joint Program Executive Office for Armaments and Ammunition opened a new factory to produce metal for artillery shells in Mesquite, Texas. This new facility is designed to incorporate as much technology as possible, with an automated production process that can produce different sizes of shells using guided automated vehicles and a digital capture capability, which enhances quality control and audit. The financing of the facility is also innovative: The Army takes ownership of the capital equipment and then leases it back to the operators, General Dynamics Ordnance and Tactical Systems. Further, given the relatively old tech standard 155mm shell, this factory will accommodate innovations to reduce drag on the projectile and therefore increases its range. With this approach, modern defense investments are preparing for the future. In the event of a surge in demand, it is much easier to accommodate with a highly automated facility.

Another lesson being digested is the need for precision weapons, which offer significant advantages over dumb munitions. They are more costly but more efficient and allow easier access to enemy targets while preventing exposure of domestic aircraft or ships or vehicles.

Defense reviews evidence the extent to which militaries prioritize electronic warfare assets and command and control

capabilities. In simple terms, the use of electronic warfare uses electromagnetic energy to control the electromagnetic spectrum ("the spectrum") and attack an enemy. The spectrum is a range of frequencies for electromagnetic energy. Electronic warfare supports command and control by allowing military commanders' access to the spectrum to communicate with forces, while preventing potential adversaries from accessing the spectrum to develop an operational picture and communicate with their forces and effectively direct activity. Some have argued that electronic warfare is a powerful component of anti-access/area denial campaigns.

General Sir Roland Walker, the new head of the British Army, has set out the objective to double the army's lethality by 2027 and triple it by the end of the decade.[63] This means modernizing and investing in technology and firepower—fast. That is why companies like Microsoft, ChatGPT, Kratos,[64] AeroVironment[65] and Starlink are included in today's definition of the defense Industry.

To that end, the British Army Battle Lab opened in 2022 and will, through investment and collaboration with partners, industry, and allies, enable the early adoption of next generation capabilities. It is part of a joint environment innovation hub known as "Defence BattleLab." A new Experimentation and Trials Group, based around the Second Battalion, the Royal Yorkshire Regiment and specialist trials and development units, takes the lead on trialing new technologies and integrating them into the way that the British Army fight and operate.[66]

Many pension funds also have existing investments in dual-use technologies such as AI, facial recognition and secure communications. These technologies, with both military and civilian applications, also sit on the spectrum increasing the value of spectrum control.

AI can be useful for ministries of defense in the same way it can be for any large complex organization that employs hundreds of thousands of people and requires vast amounts of data to be checked, cross-checked, utilized and stored securely, the maintenance of hardware, the stocking of inventories, and logistics management. For example, an AI software that sifts through satellite photos, incoming readings from drones and sensors, or simply predicts when the parts of a Bradley fighting vehicle will need replacing saves money as well as lives. AI can also be used to aid commanders in the field to parse large quantities of diverse information extremely fast to enable effective decision making. It has been widely reported (and rebuffed by the Israeli Defense Forces) that the IDF uses a program called Lavender[67] to help identify targets. It is thought to be a decision-support system, which can put together different inputs like photos, voice recordings and satellite images and positioning to help build conviction in targeting a particular building or area, which enables unprecedented speed in responsive targeting.

Meanwhile, the US Department of Defense Space Force's Space Systems Command has just awarded four agreements to private sector companies to provide solutions to build a "Resilient Global Positioning System" (R-GPS), given both Russia and China have satellite destruction capabilities and the US military is highly dependent on a fully functioning GPS network.[68] The winning companies are Astranis,[69] Axient,[70] L3 Harris[71] and Sierra Space.[72]

Earlier this year, it also published its first Commercial Space Strategy,[73] which aims to develop ways to work with private sector companies to take advantage of innovation and new technologies in the space domain.

The takeaway here must be that as the new defense requirements include more advanced technologies that become dual use, the universe of potential areas of investment in defense has widened to include these new areas. That should, at least in principle, facilitate the entry into this fast-growing and highly prioritized sector of asset owners and long-term investors.



What could go wrong?

There are three main areas where the ambitious plans for the new European defense industry could be derailed: execution, finance, and domestic politics. Execution risk is always present in every undertaking and in theory, at least, it is manageable through good governance and clear objectives. Finance is important, and these demands for higher defense spending are coming at a time when most countries already have significant tax and debt burdens which are hard to reduce in times of pedestrian economic growth. This is a theme that becomes easily politicized, at a time when the established political parties appear to have lost popular trust. This provides an opportunity for populists on all sides to argue that defense spending comes at the expense of social spending and that peace can be maintained at negligible cost.

Debt is an issue, and taxes are already high in Europe and the United Kingdom

According to Eurostat, 11 countries in the EU have debt-to-GDP ratios over the agreed threshold of 60%, as of the end 2023. The average tax revenue for European NATO allies in 2022 was 34% of GDP (exactly the OECD average), 15% higher than for Asia-Pacific countries, and 12.5% higher than OECD peers in the Americas.[74] That makes it virtually impossible for these governments to increase defense budgets by raising taxes. Furthermore, 10 EU member states are struggling to reduce deficits that exceed the agreed threshold of 3% of GDP, as of the end of 2023.[75] France, Italy and Hungary are most exposed, with public deficits of 5.5%, 7.4% and 6.7% respectively. These thresholds were set in 1997, but the situation has changed dramatically after public debt increased to cope with the COVID-19 pandemic and the 2022 cost-of-living crisis. It is most likely that the EU will revise the rules to cope with this new and potentially existential threat.

In total, seven of the European NATO members are spending more on debt service costs than on defense.

For some, the existing scale of public debt is a big constraint, if its service cost is not

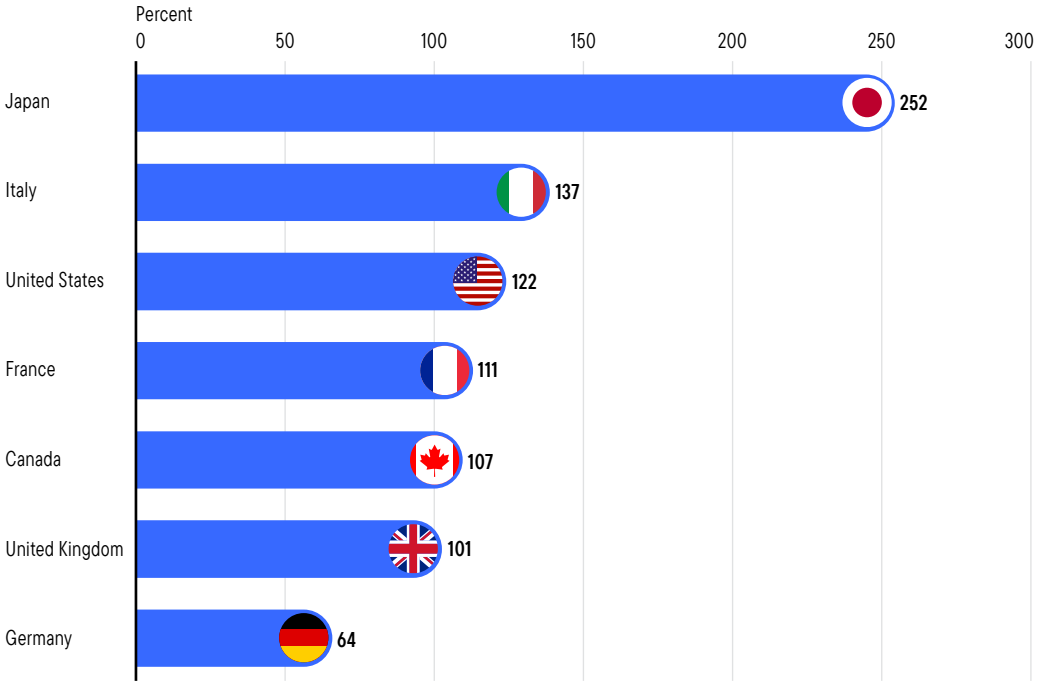
Countries like the Netherlands, Denmark, Sweden, Estonia, Czechia and Germany have low debt levels and should be able to issue paper to finance extra defense spending. Germany has an added problem; it has a constitutionally imposed "debt brake" which limits the public deficit to 0.35% of GDP.[76] Meanwhile, Italy, France, the United Kingdom, and Spain have debt-to-GDP levels exceeding 100%, so even if the cost of service is not crippling, logic suggests that the capital markets could impose a hard limit to their issuance at short notice. In total, seven of the European NATO members are spending more on debt-service costs than on defense.

As shown in Exhibit 4 on the next page, apart from Germany, the G7 countries already have significant debt. However, the cost of servicing that debt is relatively low, which implies that the real cost of increasing debt issuance to kick-start defense spending is not excessive. If Italy, for example, were to increase its debt-to-GDP ratio by 2%, the resultant cost of borrowing would probably be immaterial in the context of the government's revenues, although there are limits to the extent of borrowing imposed by the EU's rules on excessive deficits and by the capital markets.



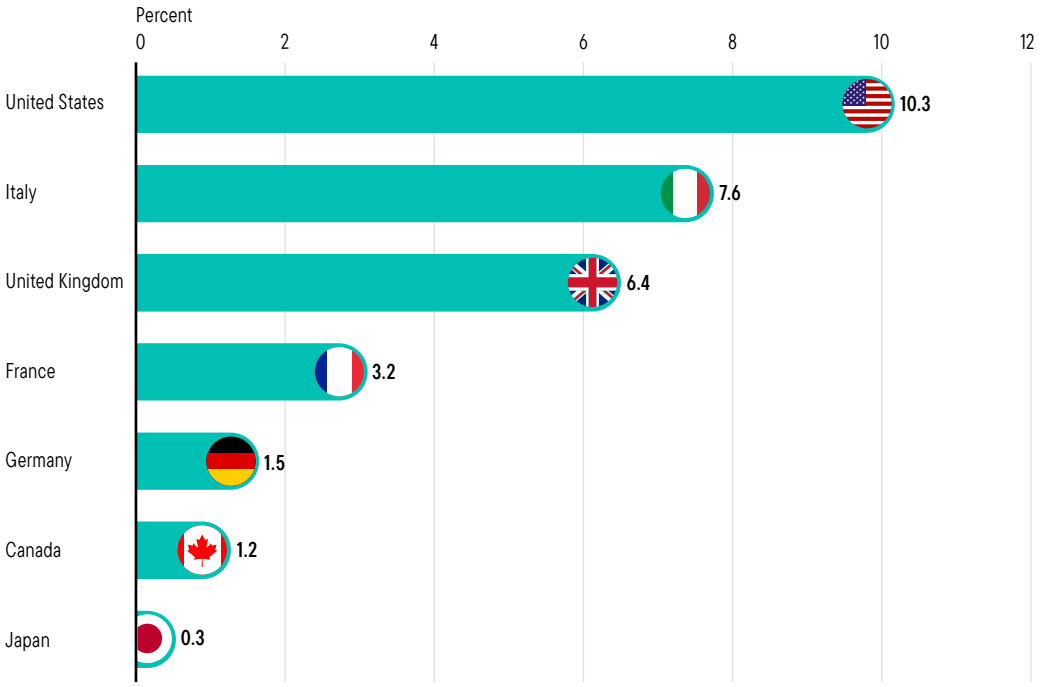
Exhibit 4: The Question of Debt—G7 Countries

Public Debt as Percentage of GDP
As of 2023



Source: United Nations Global Crisis Response Group (UN GCRG). Analysis by Franklin Templeton Institute.
Public debt refers to general government domestic and external debt. General government consists of central, state and local governments and the social security funds controlled by these units.

Interest Payment as Percentage of Government Revenue
As of 2023



Source: IMF. Analysis by Franklin Templeton Institute.
Interest payments on general government debt as a percentage of government revenues. The interest payments have been calculated as a difference between the total fiscal balance and the primary fiscal balance. The IMF provides the forecast for total fiscal balance, primary fiscal balance and the revenues in its World Economic Outlook.

In the end, financing is the key factor for success. It is possible that the public-private partnerships (PPPs) that are established might not always prosper. Sometimes there are cost overruns, sometimes execution fails, or the risks are unequally distributed, dampening enthusiasm for the next project. The United Kingdom pioneered PPPs in the 1980s yet had a high-profile failure of an outsourcing company called Carillion as recently as 2018. A subsequent report[77] on the Carillion collapse by the House of Commons public administration select committee pointed out that the government's expertise in negotiating lower prices and shifting of risk to the supplier has led companies to skimp on quality.

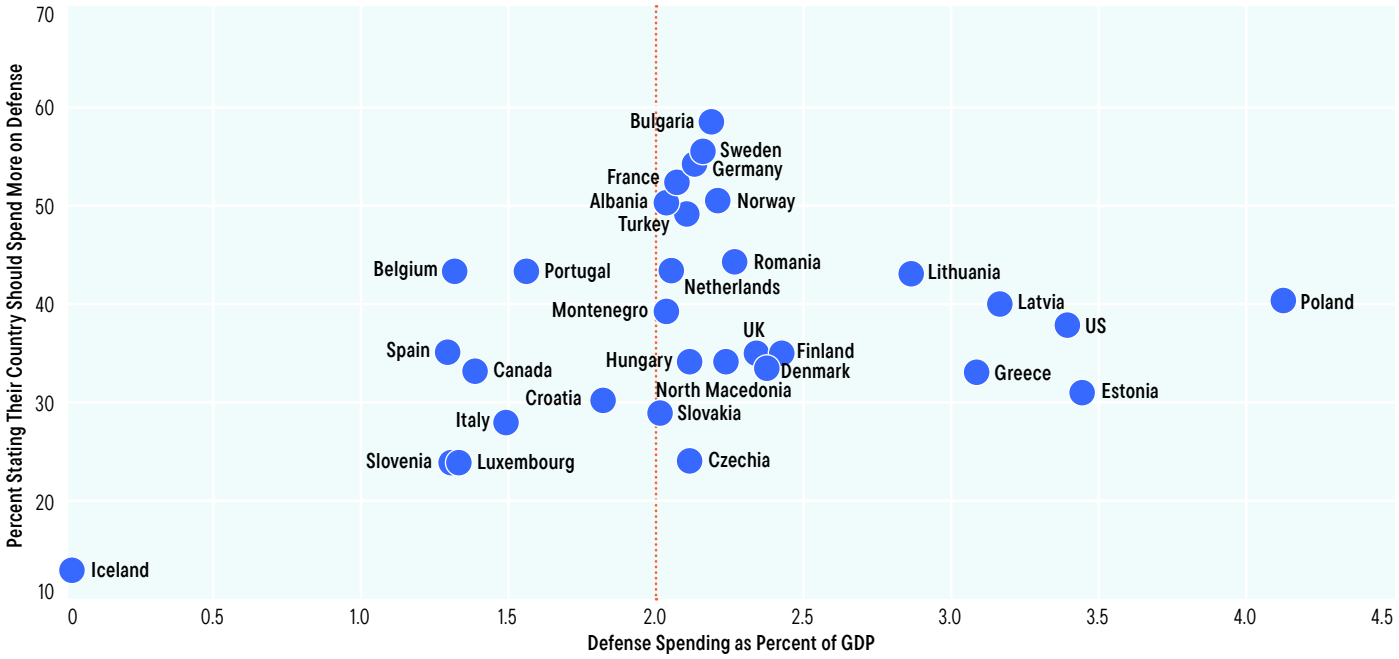
In democracies, public opinion matters

The challenges to increased defense spending are not confined to numbers or to prioritization of government expense items. NATO members are democracies, and public opinion is an important driver of government policy. NATO runs annual tracking surveys and the latest[78] showed that 77% of respondents were in favor of maintaining or increasing defense spending, but there was a big range in opinions by country. In Albania, Bulgaria, France, Germany, Norway and Sweden, at least 50% of respondents thought their country should spend more on defense. At the other extreme, only 30% of respondents in Croatia, Czech Republic, Iceland, Italy, Luxembourg, Slovakia and Slovenia think their country should increase defense spending.

However, given the real and present danger represented by Russia in the next decades, it seems the Europeans are going to do everything they can to execute properly.

Exhibit 5: NATO Members' Public Opinion on Defense Spending Matters

Sentiment Toward Increase in Defense Spending vs. Current Spending



Source: The 2023 NATO Annual Tracking Survey, International Centre for Defense and Security.
Defense spending figures are 2024 estimates. NATO survey results as of 2023.

Who are the overlooked beneficiaries?

Many countries are still in the process of holistic defense reviews, which will conclude that higher numbers are necessary. Some analysts suggest that the resulting growth in demand for equipment (hardware) could result in capital expenditure growth in the region of 12% compound annual growth to 2030. Tensions in the South China Sea have resulted in the Australian and Japanese defense reviews to conclude with demand for missile, anti-missile, anti-air, and long-range strike capabilities, including air and maritime assets. While in Europe the expectation is that a land war would be the focus, in southeast Asia, Japan and Australia, the battleground is primarily the sea, as the missile platforms will be ship- and submarine-based. In both theaters, air power that is flexible and high specification is extremely valuable.

The obvious winners from this fast-growing spend on defense equipment are the usual suspects—the large, established players in Appendix I, with strong balance sheets and stronger relationships with their buyers around the globe. European manufacturers will take market share from Russia over the next decades, as India's gradual modernization gathers pace and the managed decline in dependence on Russian arms accelerates. One example is the imminent confirmation of a deal to buy 26 Rafale fighter jets fitted for use with aircraft carriers, from Dassault of France. Separately, India has been producing the Russian Sukhoi S-30MKI fighter jets for more than 20 years, and the local content has been slowly rising, although it is still below 50%.[79] The jets still require Russian imports for the more complex parts, including the engines. The expectation is that once the local content is above 50%, it may be possible to export these aircraft to other countries without triggering the US Countering American Adversaries Through Sanctions Act (CAATSA). If that succeeds, it should produce a huge boost for both India and Russia.

But there is a less-appreciated universe of French, Italian, German and South Korean producers who are gaining market share, particularly with buyers in Europe and southeast Asia. Furthermore, Japanese companies have been banned from exporting weapons since the mid-1960s under the "Three Principles on Arms Exports" policy.[80] This ban is now under revision, with a potential reversal on the cards, which would open up lucrative new markets for Japanese defense companies.

President Yoon of South Korea is unusual in that he is the first president to rule without unified control of legislature. This means he cannot influence domestic policymaking, but foreign policy, trade and defense are under his purview. This is why he has focused so much on these areas. His objective is to grow and diversify export markets. South Korean military equipment producers are enjoying exceptional growth, partly due to the generalized tensions around the world, but also because their hardware is of high technical quality, with weapons systems that are compatible with NATO forces, at a cheaper price. Equally importantly, perhaps, is that they have capacity and short delivery times.

In July 2022, Poland placed orders of around US$15 billion[81] for main battle tanks, howitzers and light attack jets, becoming the first European client for the Hyundai Rotem (K2 tanks), KAI (aircraft) and Hanwha (K9 Howitzer), opening a promising market. In August 2024, Hanwha Aerospace completed its first overseas manufacturing plant in Australia, to build AS9 howitzers and the AS10 automated ammunition carriers for the Australian Army. It will also produce Redback Infantry Fighting Vehicles beginning in 2026.[82] The US$2.4 billion[83] Redback contract was signed in December 2023. Korea exports for all major branches of the military, including aircraft, armored vehicles, missiles and ammunition, and ships/submarines.

Many countries are still in the process of holistic defense reviews, which will conclude that higher numbers are necessary. Some analysts suggest that the resulting growth in demand for equipment (hardware) could result in capital expenditure growth in the region of 12% compound annual growth to 2030.

Conclusion

Like climate change, great power rivalries driving escalating geopolitical pressures have now become immediate, direct and global in reach, but uneven in their intensity. Geopolitical considerations influence policy and hence investment returns, both directly and indirectly, via their impact on the affected countries.

The abrupt reversal of the peace dividend has led us to the spectacle of old fashioned kinetic warfare at grand scale as well as close urban warfare, both of which had been unseen in Europe since the end of World War II. The shock has fueled a rapid acceleration of investment in defense, from the upgrading of hardware through the modernization of equipment, the updating of training to absorb the lessons of Ukraine and Gaza, the recalibration of financing and supply chains, and the investment to rapidly increase domestic industrial production capacity.

The Russian war on Ukraine has forced the world, and especially Europe, to recognize that building and maintaining a credible deterrent also requires the logistics and manufacturing base to match. In recognition of the decades-long neglect of the European defense industry, the EC has set out its first European Defense Industrial Strategy (EDIS) with an emphasis on enhancing the EU's defense readiness and to strengthen its defense technological and industrial base.

The investment case is built on concrete evidence of industrial capital expenditure plans and investment in research and development programs in a wide variety of subsectors, to the tune of around US$500 billion a year to 2030 by the European NATO members alone. Globally, defense spending in 2023 reached its ninth successive annual record totaling US$2.4 trillion.

Three elements of the investment case appear to be mispriced:

- The **magnitude** of the public and private sector capital expenditure in defense. Many countries are still in the process of reviewing their defense architecture in the light of lessons learned in Ukraine and the Middle East. This process will result in a new set of priorities and requirements to suit modern asymmetric warfare, across multiple domains. It seems prudent to assume that the amount of capital investment will be significantly higher than currently expected.
- The **longevity** of this investment theme seems underappreciated. The combination of changes in capabilities that militaries now require to defend their countries is enormous in scale and in reach, which implies a decades long runway.
- The **wide range of opportunities** for investors. As the template defense structure changes, so does the definition of the defense industry. The range covers both the traditional (non-proscribed armaments) and the exciting new technologies (LEO Satellite mapping/communications, AI enhanced data management programs, etc.). Much of this will doubtless be transferred to civilian applications. Finally, there is a group of companies in a variety of geographies (South Korea, India and Japan) that stand to benefit from this investment theme.

Traditionally, asset owners with ESG principles shunned all defense companies, along with all fossil fuel companies, regardless of their intrinsic worth. Today, the mood music has changed, forced by the Russian aggression on Ukraine, and most pension funds in Northern Europe have pivoted to accept the need for investment in defense for the national interest.

The approaches taken include the traditional "rules-based" public equity investment, bonds, and real assets/infrastructure, which has opened up demand for private equity and venture capital, especially in the United States and Europe.

Like climate change, great power rivalries driving escalating geopolitical pressures have now become immediate, direct and global in reach, but uneven in their intensity. Geopolitical considerations influence policy and hence investment returns, both directly and indirectly, via their impact on the affected countries.



Asset owners and professional investors can achieve exposure to some of the highest-priority defense spending by investing in the dual-use technologies which reflect the real transformation of the new defense industry. These are priorities because they cover asymmetric warfare, which most militaries are currently underprepared for. They include cybersecurity, low-Earth-orbit satellite communications, and unmanned drones for air, surface and underwater surveillance, reconnaissance and mine clearing, to name only a few. As the increased investment in defense is designed to prepare for modern asymmetric warfare, so does investment in military R&D. This means that these capabilities will develop faster, resulting in innovations that can easily transfer to civilian applications. Further along the line, they may find their way into a variety of economic sectors, driving productivity longer term.

In terms of asset class choices, it is hard to be prescriptive, but to gain exposure to the fastest-growing, higher-value segment of the sector, dual-use technologies, communications resilience, innovative unmanned vehicles, and high specification missile defense capabilities are the main areas we believe to be worth focusing on. In these areas, there are few pure-play vehicles in the public markets, so private equity or direct participation in real assets appear the most promising in the long term.

In our view, the most exciting area to investigate is the involvement of non-traditional, specialist technology companies. In the same way as Space X[84] and Palantir[85] have blossomed thanks to their disruption of the defense sector, new players like Anduril[86] and Shield AI[87] have leapt to unicorn status. The latest entrants are finding niches they can disrupt, and they are the new technology disruptors. The requirements of modern warfare involve seamless coordination at high speed across multiple domains, which provides opportunities for these (usually) small companies. According to some studies, there have been around 850 funding rounds for these kinds of companies in the United States alone since 2018.

Investing or not investing in defense is an internal discussion for each asset owner. The investment and ethical beliefs of the investor cannot supersede those of their stakeholder group. Some investors will have clear fiduciary responsibility to principles that preclude this type of investment and will be truly clear about what they can and cannot do. Others may be more able to align with government policy, if one emerged. Unsurprisingly, there is a wide range of investment policy in evidence today, with a range of speeds of implementation.

Contributors



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Appendix I

The largest defense companies in the world by 2022 sales

The SIPRI Top 100 arms-producing and military services companies in the world, 2022[88]

Rank (2022)	Company	Country	Arms Revenue mm (2022)	Total Revenue mm (2022)	Arms Revenue as a % of total revenue (2022)
1	Lockheed Martin Corp.	United States	$59,390	$65,984.00	90%
2	Raytheon Technologies	United States	$39,570	$67,074.00	59%
3	Northrop Grumman Corp.	United States	$32,300	$36,602.00	88%
4	Boeing	United States	$29,300	$66,608.00	44%
5	General Dynamics Corp.	United States	$28,320	$39,407.00	72%
6	BAE Systems	United Kingdom	$26,900	$27,712.00	97%
7	NORINCO	China	$22,060	$82,537.00	27%
8	AVIC	China	$20,620	$82,499.00	25%
9	CASC	China	$19,560	$44,458.00	44%
10	Rostec	Russia	$16,810	$30,295.00	55%
11	CETC	China	$15,080	$55,837.00	27%
12	L3Harris Technologies	United States	$12,630	$17,062.00	74%
13	Leonardo	Italy	$12,470	$15,025.00	83%
14	Airbus	Trans-European	$12,090	$61,805.00	20%
15	CASIC	China	$11,770	$37,364.00	32%
16	CSSC	China	$10,440	$51,443.00	20%
17	Thales	France	$9,420	$18,479.00	51%
18	HII	United States	$8,750	$10,676.00	82%
19	Leidos	United States	$8,240	$14,287.00	58%
20	Amentum	United States	$6,560	$8,750.00	75%
21	CSGC	China	$6,460	$42,507.00	15%
22	Booz Allen Hamilton	United States	$5,900	$9,259.00	64%
23	Dassault Aviation Group	France	$5,070	$7,288.00	70%
24	Elbit Systems	Israel	$4,960	$5,512.00	90%
25	Rolls-Royce	United Kingdom	$4,930	$15,647.00	32%
26	CACI International	United States	$4,820	$6,703.00	72%
27	Honeywell International	United States	$4,630	$35,466.00	13%
28	Rheinmetall	Germany	$4,550	$6,742.00	67%
29	Naval Group	France	$4,530	$4,578.00	99%
30	Peraton	United States	$4,410	$7,000.00	63%
31	General Electric	United States	$4,410	$76,555.00	5.8%
32	MBDA	Trans-European	$4,380	$4,428.00	99%
33	KBR	United States	$4,270	$6,564.00	65%
34	Safran	France	$4,200	$20,021.00	21%
35	Israel Aerospace Industries	Israel	$4,100	$4,973.00	82%
36	United Shipbuilding Corp.	Russia	$3,950	$5,011.00	79%
37	Sandia National Laboratories	United States	$3,920	$4,409.00	89%
38	Science Applications International Corp.	United States	$3,780	$7,704.00	49%
39	Saab	Sweden	$3,700	$4,154.00	89%
40	Babcock International Group	United Kingdom	$3,680	$5,473.00	67%

Rank (2022)	Company	Country	Arms Revenue mm (2022)	Total Revenue mm (2022)	Arms Revenue as a % of total revenue (2022)
41	Hindustan Aeronautics	India	$3,460	$3,643.00	95%
42	Rafael	Israel	$3,380	$3,450.00	98%
43	Mitsubishi Heavy Industries	Japan	$3,250	$32,000.00	10%
44	KNDS	Trans-European	$3,200	$3,366.00	95%
45	Textron	United States	$ 2,910	$12,869.00	23%
46	Fincantieri	Italy	$2,820	$7,825.00	36%
47	CEA	France	$2,790	$6,135.00	45%
48	Hanwha Aerospace	South Korea	$2,780	$5,561.00	50%
49	Bechtel Corp.	United States	$2,740	. .	. .
50	NCSIST	Taiwan	$2,590	$2,859.00	91%
51	V2X	United States	$2,520	$2,891.00	87%
52	TransDigm Group	United States	$2,330	$5,429.00	43%
53	Parker-Hannifin Corp.	United States	$2,270	$19,065.00	12%
54	ManTech International Corp.	United States	$2,190	$2,690.00	81%
55	ST Engineering	Singapore	$2,180	$6,554.00	33%
56	General Atomics	United States	$2,140	. .	. .
57	Oshkosh Corp.	United States	$2,140	$8,282.00	26%
58	Jacobs Engineering Group	United States	$2,090	$14,923.00	14%
59	Teledyne Technologies	United States	$2,020	$5,459.00	37%
60	ASELSAN	Türkiye	$2,020	$2,131.00	95%
61	CNNC	China	$1,940	$39,046.00	5.0%
62	ThyssenKrupp	Germany	$1,930	$43,270.00	4.5%
63	Bharat Electronics	India	$ 1,920	$2,208.00	87%
64	Serco Group	United Kingdom	$1,850	$5,883.00	31%
65	Kawasaki Heavy Industries	Japan	$1,830	$13,139.00	14%
66	Atomic Weapons Establishment	United Kingdom	$1,780	$1,821.00	98%
67	LIG Nex1	South Korea	$1,720	$1,720.00	100%
68	BWX Technologies	United States	$1,700	$2,234.00	76%
69	Hensoldt	Germany	$1,660	$1,795.00	92%
70	QinetiQ	United Kingdom	$1,620	$ 1,949.00	83%
71	PGZ	Poland	$1,600	$1,775.00	90%
72	Sierra Nevada Corp.	United States	$1,560	$1,656.00	94%
73	Korea Aerospace Industries	South Korea	$1,550	$2,147.00	72%
74	Parsons Corp.	United States	$1,540	$4,195.00	37%
75	Eaton	United States	$1,520	$ 20,752.00	7.3%
76	Baykar	Türkiye	$1,420	$1,500.00	95%
77	CAE	Canada	$1,420	$3,230.00	44%
78	Curtiss-Wright Corp.	United States	$1,390	$2,557.00	54%
79	Moog	United States	$1,280	$3,036.00	42%
80	Fujitsu	Japan	$1,270	$28,277.00	4.5%
81	UkrOboronProm	Ukraine	$1,260	$1,279.00	99%
82	Turkish Aerospace Industries	Türkiye	$1,260	$1,557.00	81%
83	Kongsberg Gruppen	Norway	$1,230	$3,309.00	37%
84	Amphenol Corp.	United States	$1,140	$12,623.00	9.0%
85	United Launch Alliance	United States	$1,070	$1,158.00	92%

Rank (2022)	Company	Country	Arms Revenue mm (2022)	Total Revenue mm (2022)	Arms Revenue as a % of total revenue (2022)
86	Mitre Corp.	United States	$1,060	$2,200.00	48%
87	Melrose Industries	United Kingdom	$1,060	$9,292.00	11%
88	The Aerospace Corp.	United States	$1,040	$1,190.00	87%
89	Mazagon Dock Shipbuilders	India	$1,000	$997.00	100%
90	Navantia	Spain	$990	$1,411.00	70%
91	Austal	Australia	$980	$1,101.00	89%
92	Mercury Systems	United States	$960	$974.00	99%
93	Diehl	Germany	$950	$3,688.00	26%
94	Ball Corp.	United States	$930	$15,349.00	6.1%
95	Howmet Aerospace	United States	$920	$5,663.00	16%
96	TTM Technologies	United States	$860	$2,495.00	34%
97	HEICO Corp.	United States	$860	$2,208.00	39%
98	Hyundai Rotem	South Korea	$820	$2,450.00	33%
99	IHI Corp.	Japan	$790	$10,302.00	7.7%
100	Roketsan	Türkiye	$790	$790.00	100%

. . = data not available or not applicable;
Source: SIPRI Arms Industry Database, retrieved September 25, 2024.

Appendix II

The 40 largest importers of major arms and their main suppliers, 2019–23

The 40 largest importers of major arms and their main suppliers, 2019-23[89]

Rank	Importer	Share of global arms imports (%)		Percent change from 2014–18 to 2019–23*	Main suppliers and their share of importer's total imports (%), 2019–23					
		2019–23	2014–18		1st	%	2nd	%	3rd	%
1	India	9.8	9.1	4.7	Russia	36	France	33	USA	13
2	Saudi Arabia	8.4	11	-28	USA	75	France	7.6	Spain	7
3	Qatar	7.6	1.5	396	USA	45	France	25	Italy	15
4	Ukraine	4.9	0.1	6633	USA	39	Germany	14	Poland	13
5	Pakistan	4.3	2.9	43	China	82	Sweden	4	Turkey	3.8
6	Japan	4.1	1.5	155	USA	97	UK	1.8	Germany	0.4
7	Egypt	4	5.3	-26	Germany	27	Italy	22	Russia	20
8	Australia	3.7	4.6	-21	USA	80	Spain	15	Switzerland	2.3
9	South Korea	3.1	2.8	6.5	USA	72	Germany	15	France	9.3
10	China	2.9	4.9	-44	Russia	77	France	13	Ukraine	8.2
11	United States	2.8	1.6	67	UK	25	Netherlands	12	France	10
12	Kuwait	2.7	1	169	USA	70	Italy	20	France	8.6
13	United Kingdom	2.4	1.6	41	USA	89	South Korea	4	Israel	2.7
14	UAE	2.4	3.3	-31	USA	57	Turkey	9.9	France	9.2
15	Israel	2.1	2	5.1	USA	69	Germany	30	Italy	0.9
16	Netherlands	1.9	0.2	751	USA	99	Finland	0.6	Germany	0.6
17	Turkey	1.6	2.2	-29	Spain	31	Italy	23	Russia	15
18	Norway	1.6	0.8	92	USA	89	South Korea	4.8	Italy	3.6
19	Poland	1.6	0.4	253	USA	45	South Korea	34	UK	4.4
20	Singapore	1.5	1.3	17	Germany	32	France	27	USA	26
21	Algeria	1.1	4.8	-77	Russia	48	Germany	15	China	14
22	Philippines	1	0.5	105	South Korea	37	Israel	28	USA	14
23	Indonesia	1	2.4	-60	USA	27	South Korea	18	France	17
24	Italy	0.9	1.4	-37	USA	95	Germany	1.8	France	1.4
25	Greece	0.9	0.9	-4.2	France	58	USA	21	UK	11
26	Bangladesh	0.9	1.2	-31	China	72	Turkey	9.7	UK	5.5
27	Brazil	0.8	0.6	26	France	40	Sweden	23	Italy	13
28	Thailand	0.8	1.1	-30	China	44	South Korea	13	USA	9.9
29	Morocco	0.8	1.4	-46	USA	69	France	14	Israel	11
30	NATO**	0.7	<0.05	1638	France	68	USA	17	UK	15
31	Bahrain	0.7	0.1	562	USA	93	Turkey	3	Italy	1.9
32	Romania	0.6	0.2	180	USA	71	Switzerland	11	Portugal	6.3
33	Kazakhstan	0.6	0.9	-30	Russia	94	France	1.4	Spain	1.4
34	Germany	0.6	0.2	188	USA	63	Israel	16	UK	5.7
35	Canada	0.6	1.1	-44	Australia	32	USA	27	Spain	22
36	France	0.6	0.3	112	UK	38	USA	20	Italy	18
37	Denmark	0.6	0.3	99	USA	70	Switzerland	16	Germany	10
38	Myanmar	0.6	0.7	-20	Russia	38	China	26	India	18
39	New Zealand	0.5	0.1	338	USA	69	South Korea	12	UK	11
40	Belarus	0.5	0.4	30	Russia	100	NA	NA	NA	NA

NATO = North Atlantic Treaty Organization; UAE = United Arab Emirates. * Figures show the change in volume of the total arms imports per importer between the two periods. ** The data is for imports by the organization itself, not the total imports by NATO member states. Source: SIPRI Arms Transfers Database, Mar. 2024.

Appendix III

Weapons regulated by International Humanitarian Law

Weapon	Treaty
Explosive devices weighing less than 400 g	Declaration of St. Petersburg (1868)
Bullets that expand or flatten in the human body	Hague Declaration (1899)
Poison and poisoned weapons	Hague Regulations (1907)
Chemical Weapons	Geneva Protocol (1925)
Biological Weapons	Geneva Protocol (1925)
Weapons that injure by fragments, which escape detection by X rays in the human body	Protocol I (1980) to the Convention on Certain Conventional Weapons
Incendiary weapons	Protocol III (1980) to the Convention on Certain Conventional Weapons
Blinding laser weapons	Protocol IV (1995) to the Convention on Certain Conventional Weapons
Mines, booby traps "other devices"	Protocol II, as amended (1996), to the Convention on Certain Conventional Weapons
Anti-personnel mines	Convention on the Prohibition of Anti-Personnel Mines (Ottawa Treaty) (1997)
Explosive remnants of war	Protocol V (2003) to the Convention on Certain Conventional Weapons
Cluster munitions	Convention on Cluster Munitions (2008)

Source: International Committee of the Red Cross, "Weapons", November 30, 2011
https://www.icrc.org/en/document/weapons#:~:text=A%20number%20of%20conventional%20weapons,traps%20and%20%22other%20devices%22.

Appendix IV

US Department of Defense contracting with smaller companies

The US Department of Defense has had a long history of being open to contracting with small companies and typically has proportions of procurement areas ring fenced for this purpose.

With the intention to develop and acquire new technologies at a faster pace, the US Space Force has selected 20 small businesses for a potential seven-year, $1 billion contract[90] vehicle focused on software development. The Space Rapid Capabilities Office has selected a pool of companies in support of the service branch's effort to further develop a next-generation ground system that leans on commercial cloud architecture. These companies will compete for contracts on a task by task basis, with an initial five-year base period and a single two-year option.

Name	Description	HQ
Blue Origin (Jeff Bezos)	American aerospace manufacturer, government contractor, launch service provider, and space technologies company.	Kent, WA, US https://www.blueorigin.com/
CACI International	American multinational professional services and information technology company. CACI provides services to many branches of the US federal government including defense, homeland security, intelligence, and health care.	Virginia, US https://www.caci.com/
Viasat	Provider of high-speed satellite broadband services and secure networking systems covering military and commercial markets.	Carlsbad, CA, US https://www.viasat.com/
General Atomics	American energy and defense corporation, that specializes in research and technology development. This includes physics research in support of nuclear fission and nuclear fusion energy. The company also provides research and manufacturing services for remotely operated surveillance aircraft, including its MQ-1 Predator drones, airborne sensors, and advanced electric, electronic, wireless, and laser technologies.	San Diego, CA, US https://www.ga.com/
Aalyria (spin off from Google)	Aalyria is creating, organizing and managing the world's most advanced networks to enable connectivity everywhere at the speed of discovery. It brings together two technologies originally developed at Alphabet as part of its wireless connectivity efforts: Atmospheric laser communications technology and a software platform for orchestrating networks across land, sea, air, space and beyond. It is backed by leading Silicon Valley investors including the founders of Accel, J2 Ventures and Housatonic.	Livermore, CA, US https://www.aalyria.com/company
A.I. Solutions	Providing engineering services and products for space mission planning, design and operations for civil, commercial and defense organizations.	Lanham, MD, US https://ai-solutions.com/
Defense Unicorns (raised US$35 million in its Series A funding round from investorsled by Sapphire Ventures and Ansa Capital)	A provider of artificial intelligence capabilities and open source software for national security, specializes in platform technologies that enable rapid and reliable delivery of capabilities across all DoD mission environments.	Colorado Springs, CO, US https://www.defenseunicorns.com/
Frontier Technology Inc	Provides a broad, integrated and seamless data analytic ecosystem which includes AI/ML-enhanced data integration, data analytics, modeling and defensive/resilient cyber technology and services to enhance the ability of the Department of Defense, intelligence community and other agencies of the Federal Government to make the best decisions possible in support of their missions. Solutions can be operational quickly, at lower cost than alternatives, and customers continue to own their own data.	Beavercreek, OH, US https://www.ftidefense.com/
Giuseppe Engineering	Systems Engineering; Space Systems Architecture; Modeling, Simulation and Analysis; Spaceport Development; Cyber Security; Digital Architectures.	Colorado Springs, CO. US https://giuseppespace.space/
Infinity Systems Engineering, Ltd	Systems and Safety Engineering Consultancy focused on the successful delivery of engineering projects in multiple sectors.	Bristol, UK https://www.infinity-systems.co.uk/

Name	Description	HQ
Infinity Systems Engineering, Ltd	Systems and Safety Engineering Consultancy focused on the successful delivery of engineering projects in multiple sectors.	Bristol, UK https://www.infinity-systems.co.uk/
IS4S – Integrated Solutions for Systems	A small business that provides a wide range of engineering and management solutions to government, military, and commercial customers. Founded in 2008, IS4S specializes in PNT, missile system engineering, energetic research and development, vehicle electronics, additive manufacturing, and other innovative technologies.	Huntsville, Alabama, US https://is4s.com/
NewSat North America	C5ISR systems with NewSat North America! We provide world-class systems, products, and services to US Government customers and our foreign allies.	Indian Harbor Beach, Florida, US https://www.newsatnorthamerica.com/
Northstrat	Provides strategic information technology (IT) solutions to US government agencies in the intelligence, defense and law enforcement communities.	Sterling, Virginia, US https://northstrat.com/
Omitron	Provides technical expertise in ground systems, flight operations, flight dynamics, trajectory design and analysis, software tools, space situational awareness and on-orbit spaceflight safety.	Beltsville, MD, US
Omni Federal	Design and delivery of user-centric digital solutions across data, analytics, business process automation, cloud, and mobile applications.	St. Louis Missouri, US https://www.omnifederal.com/
Pacific Crest Alliance	Advanced technology research and development, artificial intelligence, and cybersecurity systems engineering.	San Diego, CA, US https://pacificcrestalliance.com/
Picogrid (March 2024: $12 million seed round led by Initialized Capital with participation by Starburst Ventures, Credo Ventures, Giant Step Capital, Domino Ventures, and Alumni Ventures.)	Picogrid builds a unified platform for autonomous systems, creating an open ecosystem of defense technology suppliers. The company's technology helps connect and remotely control sensors, drones, command interfaces, and other notoriously fragmented defense systems.	El Segundo, CA, US https://picogrid.com/
Quantum Research International, Inc	Deliver innovative systems and solutions to meet the challenges fighting in this evolving multi-domain environment. Global security challenges in the key areas of Cyber, Space, Air, Land, Support Enablers and Advanced AV Design.	Huntsville, Alabama, US https://www.quantum-intl.com/
Raft A.I.	***Raft*** is a smart logistics platform that automates the freight process for complete control and visibility. AI-powered workflow automation.	London, UK https://www.raft.ai/
Rogue Space Systems Corp.	Provide in-space infrastructure and services through our autonomous AI, robotic Orbot systems to commercial, civil and government customers.	Lagonia, New Hampshire https://rogue.space/
Sphinx Defense	Builds software to solve complex national security problems for America and its allies.	Washington, DC, US https://www.sphinxdefense.com/
STR	Builds technology platforms in cybersecurity, distributed sensing and AI.	Woburn, MA, US https://str.us/
Tap Here! Technology	Small business that specializes in engineering and global mission support services.	Manassas, VA, US https://www.taphere.com/
True Anomaly	Builds technology at the intersection of spacecraft, software, and AI to enhance the capabilities of the United States, its allies, and commercial partners.	Colorado Springs, CO, US https://www.trueanomaly.space/

Source: International Committee of the Red Cross, "Weapons", November 30, 2011.

Deep Waves

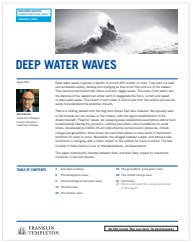
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Powerful “waves” are sweeping away established assumptions, fundamentally altering the economic, political and public policy foundations for asset prices. Join the discussion with our strategists and explore the interplay between the long-term drivers that face investors over the coming decade.

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Introduction: Long-term drivers that face investors

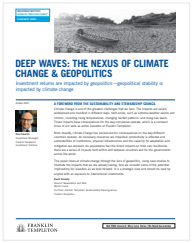
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The population of workers in mostly high-income countries are shrinking while social costs increase. We examine the drivers of these changes and offer conclusions on their investment implications.



August 2023

The corporate and household debt wave

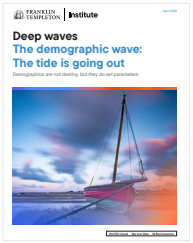
As we depart from the zero-rate world into the realm of structurally tighter financial conditions, we focus on household and corporate debt and assessing the “quality” of investments.



April 2024

The demographic wave—the tideis going out

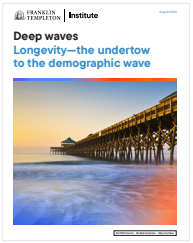
Demographics are a driver of country risk for investors, and they can impact productivity, economic growth, sovereign financials and debt ratings. Demographics are not destiny, but they do set parameters.



August 2024

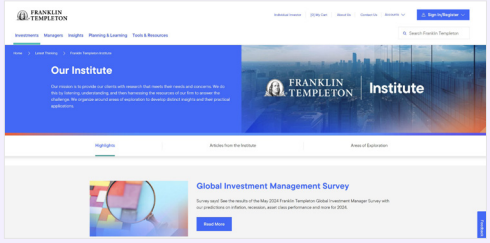
Longevity—the undertow to the demographic wave

Financial services firms can develop longer client relationships by placing extra emphasis on building trust with aging investors.



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Endnotes

1. Source: "Deep Water Waves." Franklin Templeton Institute. August 16, 2021.
2. North Atlantic Treaty Organization members are Albania, Belgium, Bulgaria, Canada, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Turkey, the United Kingdom and the United States.
3. Source: "Defense Expenditure of NATO Countries 2014-2024" NATO. June 17, 2024.
4. Source: The Stockholm International Peace Research Institute. The SIPRI Yearbook 2024.
5. Sources: IMF, NATO, Franklin Templeton Institute calculations. (IMF GDP projections and NATO members' statements on future defense spending as % of GDP). There is no assurance any estimate, forecast or projection will be realized.
6. Nuclear weapons are in a category of their own, and the others are listed in Appendix III.
7. Carl von Clausewitz was a Prussian professional soldier and staff officer who saw extensive combat and even today is recognized as one of the world's foremost military theorists. He was the first to focus on the psychological and political aspects of waging war and used his experiences of the Napoleonic wars to inform his opinions.
8. Source: The European Defense and Security Summit. April 17, 2024.
9. Essentially, the argument was that the great ideological battles between East and West were over, and that Western liberal democracy had triumphed, meaning that most countries would accept that Western liberal democracy, with its elegant balance of freedom and equality, could not be bettered.
10. Source: "2024 Vital Signs Report." National Defense Industry Association (NDIA). April 4, 2024.
11. People's Liberation Army of China is the name for the Chinese Armed Forces.
12. Source: "Defense Expenditure of NATO Countries." NATO, 2014-2024. June 17, 2024.
13. Source: The Stockholm International Peace Research Institute. The SIPRI Yearbook 2024.
14. Sources: IMF, NATO, Franklin Templeton Institute calculations. (IMF GDP projections and NATO members' statements on future defense spending as % of GDP). There is no assurance that any estimate, forecast or projection will be realized,
15. Source:, "Next Generation EU delivery – How are the Member States doing?" European Parliament Briefing. June 2023.
16. Source: US Department of Defense, FY2024 Summary. Data through August 31, 2024.
17. Source: Reuters. September 30, 2024.
18. Source: World Bank Data. As of 2023.
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22. Source: McGerty, F. IISS, Military Balance Blog. May 23, 2024.
23. Source: "Global Firepower." (September 6, 2024). Countries with the largest defense budget in Latin America in 2024 (in billion US dollars) [Graph]. Statista. Retrieved September 30, 2024.
24. Source: European Commission press release: "The EC and the European Investment Fund join forces to boost investment in Defense innovation through the Defense Equity Facility." January 12, 2024.
25. Source: BAE Systems, Munitions, 155mm Artillery Ammunition.
26. Source: BAE Systems press release. November 30, 2020.
27. PensionDanmark is providing the finance to a newly formed consortium, Danske Patruljeskibe K/S, comprising Defense group Terma and ship designers Odense Maritime Technology (OMT.) The first customer is the Danish Ministry of Defense Acquisition and Logistics Organization (DALO). Once this order has been completed, the consortium hopes to begin building military vessels for navies of other countries, too.
28. Source: Korean Economic Times. February 16, 2024.
29. Source: "What are PPPs?" UN Trade & Development (UNCTAD) Investment Policy Hub.
30. In English, it means a "turning in time," or a change in paradigm. The last time a Wende (turning) was used was in 1989-1990, referring to German reunification.
31. Source: The Bundestag annual report 2023, Parliamentary Commissioner for the Armed Forces. March 12, 2024.
32. Source: "National Security Strategy." The German Federal Government. June 2023.
33. Source: "First-ever European Defense Industrial Strategy (EDIS) to enhance Europe's Readiness and Security." European Commission. March 5, 2024.
34. Source: "The European Defense Industry Program (EDIP)." European Commission, EU Defense Industry. March 5, 2024.
35. Source: European Defense industry reinforcement through common procurement Act (EDIRPA). November 2023.
36. Source: European Air Transport Command (EATC).
37. Source: European Sky Shield Initiative (ESSI).
38. Source: US Congressional Research Service. January 18, 2023.
39. Source: Politico. August 27, 2024.
40. Source: Defense News. April 9, 2024.
41. Source: "Commission invests over €1 billion in 54 ambitious Defense industrial projects through the European Defense Fund." European Commission press release. May 16, 2024.
42. Source: Projet Loi de Finances 2024. September 2024.
43. Source: The Defence Procurement Act 2023. House of Commons Library. Published September 13, 2024.
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52. QinetiQ evaluates, integrates and secures mission critical platforms, systems, information and assets.
53. Starlink is a satellite internet constellation operated by Starlink Services, LLC, a wholly owned subsidiary of American aerospace company SpaceX.
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55. Source: Top 100 | Defense News, News about defense programs, business, and technology. Defense News. As of 2023.
56. Source: Institute for the Study of War (ISW). September 29, 2024.
57. KNDS is the 2015 merger between Kraus-Maffei Wegmann of Germany and Nexter of France.
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59. Source: Philly Shipyard, Press Release "Hanwha to acquire Philly Shipyard", June 20, 2024.
60. People's Liberation Army of China.
61. Press release, European Council President Ursula von der Leyen, March 19, 2024.
62. Source: US Army, Joint Program Executive Office Armaments and Ammunitions (JPEO A&A) 155mm Industry Summit. January 16, 2024.
63. Source: "Pulling the future into the present." British Army, Royal United Services Institute (RUSI) Land Warfare Conference. July 23, 2024.
64. Kratos is focused in areas where tech advances can have a force multiplier effect, such as unmanned systems, satellite communications, C5ISR, warfighter training and combat systems.
65. AeroVironment provides technology solutions at the intersection of robotics, sensors, AI, software analytics and connectivity.
66. Source: "The Army of the Future." UK Ministry of Defence, British Army.
67. Source: "The Israel Defense Forces' use of AI in Gaza: A case of misplaced purpose." Royal United Services Institute (RUSI). July 4, 2024.
68. Source: US Space Force Press Release. September 23, 2024.
69. Astranis builds next-gen satellites for geo-stationary orbit.
70. Axient provides specialist systems engineering & integration, systems development and logistics.
71. L3 Harris is known for its capabilities in the surveillance and reconnaissance (ISR), integrated maritime communications systems and electro optical sensors.

72. Sierra Space is an aerospace and space technologies company.
73. Source: US Space Force, Commercial Space Strategy. April 8, 2024.
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81. Source: The Korean Economic Daily. July 27, 2022.
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84. Source: Spacex website.
85. Palantir is an American company specializing in software platforms for big-data analytics.
86. Anduril is an American defense company specializing in autonomous systems.
87. Shield AI is an American Defense company that develops AI-powered fighter pilots, drones and technology for military operations.
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90. Source: Breaking Defense, June 7, 2024.

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Equity securities are subject to price fluctuation and possible loss of principal.

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